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Service

Vermont Water Resources Programs Assessment

ACKNOWLEDGEMENTS

The staff of the Soil Conservation Service in Vermont is grateful to Paul Vachon for his work in preparing much of this report.

When we first decided to undertake this assessment Paul was working for the New England River Basins Commission (NERBC), having played a major role in the completion of the acclaimed Lake Champlain Level B Study. The Soil Conservation Service was involved with the water quality portion of the Study and during that period we gained considerable respect for Paul's knowledge of Vermont's water resource problems and opportunities and his interest in and understanding of the role of agriculture.

In 1981 we worked out an arrangement with NERBC to obtain Paul's services for a period of time. We wanted him to organize and coordinate an objective look at what SCS's role in the water resource area could and should realistically be. Paul interviewed many Federal, State, regional and local groups and individuals, reviewed all appropriate material, then sat down and wrote the first draft of the assessment.

We would like to thank all those who contributed to this assessment and, of course, special thanks to Paul Vachon.

John C. Titchner
State Conservationist

Burlington, Vermont
July 1982

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INTRODUCTION

Purpose and Scope

The Vermont State Office of the U.S. Soil Conservation Service (SCS) prepared this report to document current and projected water resource problems and to spell out an SCS program strategy which contributes to their timely solutions. For long-range (10 year) program development and budgeting, priorities and directions for USDA water resources programs are established with provisions for periodic updating. The study was conducted through the Basin and Area Planning program pursuant to Section 6, PL 83-566, the Watershed Protection and Flood Prevention Act.

The report was based on existing data and published reports on Vermont problems and future plans. Interviews with water program managers in key states, as well as federal agencies were conducted to obtain their perspectives on what future SCS water resources programs would be important.

Reader's Guide to Report

The report is comprised of an introduction, report summary and four major chapters. The report summary outlines the principal findings and highlights priority problems. A three-pronged program strategy is proposed, with a schedule and cost estimates covering a decade of SCS water resources activities in Vermont. Chapter 1 describes Vermont's unique water resource conditions, and identifies government and citizen groups concerned with Vermont's waters. Chapter 2 details the State's major water resource problems and concerns.

Chapter 3 documents what SCS is now doing in Vermont to address water resource problems. Looking to the future, relevant USDA programs and authorities to address other Vermont problems are assessed. Chapter 4 describes a generalized procedure for setting priorities for future SCS programming and includes a proposed ten year program. Major program elements are described and estimated costs included. A generalized implementation schedule is presented along with identification of the potential for the Forest Service and Economic Research Service participation in future Vermont programs.

SUMMARY

In recent years, several Federal, State and private agencies and groups have taken a close look at the water resource problems facing Vermont. Often their specific objectives and methods were quite different, but they shared a common concern for the states' water resources and an interest in developing strategies that would protect the public interest and promote the general welfare. A composite summary of the most important water problems facing Vermont is:

- surface water pollution
- eutrophication of lakes and ponds
- flooding
- cropland erosion
- ground water contamination
- stream flow allocation
- acid precipitation
- water-oriented outdoor recreation
- shoreland management
- wetlands protection
- streambank erosion and management

The Soil Conservation Service (SCS), working in every town in Vermont through the states' 14 Natural Resources Conservation Districts, can help solve many of these problems through its programs aimed at protecting the soil and water resources base.

Surface water pollution and lake eutrophication are affected by the way farmers manage their operations - how they prepare their fields and handle the manure from their dairy cows in particular. SCS provides technical and financial assistance in planning, designing, constructing and monitoring erosion control and runoff management practices and systems that deal with these problems.

Flooding in Vermont can be and often is a serious problem. The steep mountains, narrow, developed valleys and harsh climate all contribute to persistent flooding in many sections of the state. While there are some opportunities for structural and non-structural PL-566 flood protection projects, such as Jewell Brook and Stevens-Rugg, most of SCS's contributions to alleviating flood damage in the state have been through preparation of Flood Hazard Analyses and Flood Insurance Studies. These evaluations provide the towns with the information they need to properly manage and develop their flood plains.

Streambank and shoreline erosion are also important problems throughout the state. Associated effects of this erosion include pollution, sedimentation, flooding, crop damage and destruction of fish and wildlife habitat. SCS has shown a commitment to dealing with these problems for the last several years by completing numerous streambank and shoreline protection projects utilizing several of its water related programs.

There are other, less serious but still significant problems that can and will involve SCS. There also are serious problems that will involve SCS in only a limited role. Soil surveys and other inventory data, as well as resource evaluations and comprehensive assessments, are used in evaluating such diverse concerns as acid precipitation, wetlands protection ground water contamination and stream flow allocation.

The national goals for SCS in the future emphasize erosion reduction, flood prevention, and to a lesser extent water supply and water quality. SCS in Vermont will be targeting its resources to erosion control, runoff management, and flood plain management.

Erosion reduction and runoff management will be accomplished through the preparation and implementation of watershed protection projects. Priorities for this activity have been developed that include watersheds in the Lake Champlain and Lake Memphremagog basins, as well as smaller lakesheds throughout the state.

The SCS flood damage reduction program will be essentially through Flood Plain Management Studies. These studies are designed to promote wise use of flood plains and reduce flood damage susceptibility. Flood prone areas are identified from which local planning commissions and zoning administrators can base sound land use decisions. SCS can also provide assistance if the flooding problem requires a structural and/or non-structural approach within the purview of PL-566.

SCS will also respond to emergency and/or short term water resource problems. This may consist of Emergency Watershed Protection following a natural disaster or special studies to analyze specific problems and recommend appropriate actions.

When appropriate, the U.S. Forest Service, Economic Research Service or other federal agencies may participate with the SCS in any or all phases of a project or study.

All of the above-described SCS activities will require close coordination with associated state agencies. In particular, the Governor of Vermont and/or the State Commissioner of Agriculture and the Secretary of Environmental Conservation have primary responsibility for water resource and agricultural-related activities and this will influence SCS priorities and objectives.

The average SCS staff commitment over the next five years to implement the water resources program is expected to require about 17 persons. Over the same period, financial assistance of about $800,000 per year is needed to implement best management practices through watershed protection projects. Beyond the five-year period there will be a continual need for SCS involvement in solving water resource problems. There will likely be a decrease in general planning and increase in detailed planning, short-term studies and evaluations, and implementation of projects. A systematic procedure will be established for monitoring and evaluating accomplishments so that the need for corrections in program direction can be forecasted. Details of the targeted resource problems, key SCS program elements, scheduling, and a forecasted budget are presented in the text.

Summary of Anticipated Costs of SCS

In Vermont For Water Resources Activities

(Thousands of Dollars)

Activity	1983	1984	1985	1986	1987
River Basins					
Flood Plain Management	35	35	35	40	46
Cooperative Studies	119	124	80	80	40
Coord. with N.E. Gov. Conf.	10	12	12	15	15
PL-566					
Planning	70	100	50	60	60
Application Tech. Asst.	196	210	269	311	388
Application Financial Asst.	538	561	754	820	1,000
Monitoring & Evaluation	128	132	127	128	126
RC&D and Other Programs					
Water Resource Related Activities	181	130	165	125	138
TOTAL	1,277	1,304	1,492	1,579	1,822

CHAPTER 1

RESOURCE SETTING - AN OVERVIEW

Location and Setting

Vermont is the second largest of the six New England States. The state is bounded by Quebec, New Hampshire, Massachusetts, and New York. Vermont is best known for its pleasant villages, rolling farmland, maple sugar, fall foliage, and winter snow. It is an essentially rural state of 9,609 square miles with a population of about 511,000. Not surprisingly considering its location, Vermont has a bountiful water supply. Precipitation averages around 42 inches, though as much as 60 inches falls annually in the mountainous areas of the north and south. Runoff annually averages about 20 inches and ranges from 10 to 42 inches, two-thirds occurring during snowmelt. The mean temperature in January ranges from 14° F. at higher elevations to 22° F. in the lowlands. July mean temperatures range from 64° F. to 70° F. * Some additional state facts follow.

STATE FLOWER: Red Clover

STATE TREE: Sugar Maple

STATE BIRD: Hermit Thrush

STATE ANIMAL: Morgan Horse

STATE INSECT: Honeybee

STATE FISH: Brook Trout (cold water)
Walleye Pike (warm water)

HIGHEST ELEVATION: Mt. Mansfield, 4,393 ft.

LOWEST ELEVATION: Lake Champlain, 95 ft.

HIGHEST RECORDED TEMPERATURE: 105° F. on July 5, 1911

LOWEST RECORDED TEMPERATURE: -50° F. in Bloomfield on December 30, 1933

TOPOGRAPHY: Rugged mountains, fertile valleys and over 400 lakes and ponds

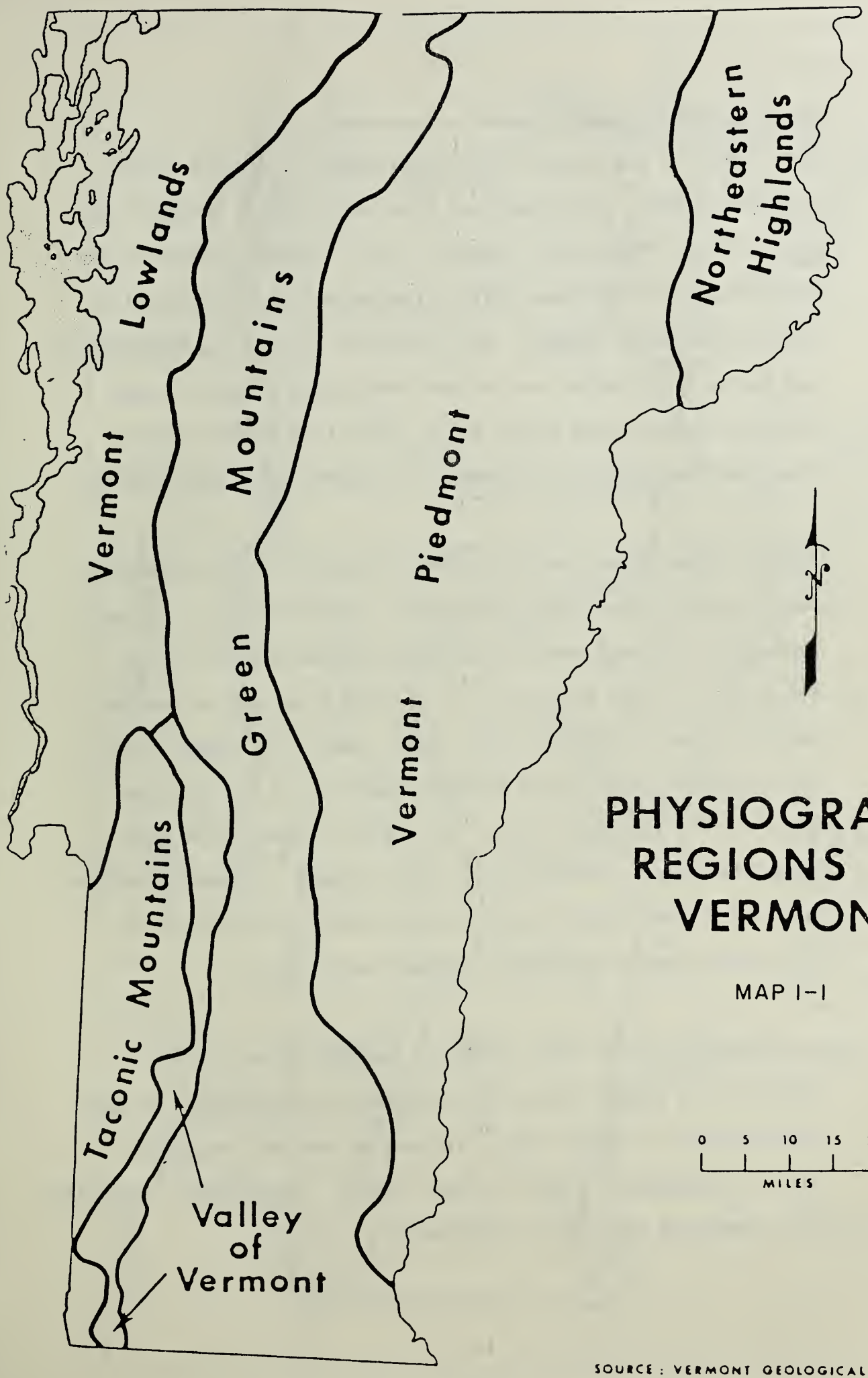
STATE MOTTO: Freedom & Unity

* Adapted from UVM, 1980.

Physiographic Regions

The Green Mountains are Vermont's outstanding physiographic feature (see Physiographic Regions Map). These mountains, with seven peaks exceeding 4,000 feet, divide Vermont waters between the Lake Champlain and Connecticut River Basins. They are a focal and unifying feature running centrally the length of the State and sometimes called "the backbone of Vermont." The streams of the Green Mountain region form the headwaters of the four major drainage basins.

West of the Green Mountains in the north along Lake Champlain lie the Vermont Lowlands, a region of gently rolling terrain with a few minor ridges and low mountains. This area is drained by the Lake Champlain Basin. In the northeast corner of the State lie the Northeastern Highlands ("The Northeast Kingdom"), a geologic extension of New Hampshire's White Mountains; a region of rugged relief with the highest average elevation in Vermont, drained by the Connecticut River Basin. To the east of the Green Mountains and extending nearly the length of the State is the Vermont Piedmont, a region characterized by low rolling hills with a few prominent monadnocks which drain into the Lake Champlain, Connecticut River, and Lake Memphremagog Basins. On the western edge of the State, south of the Vermont Lowlands, are the Taconic Mountains, a rugged mass of mountains and hills that extend into Massachusetts and New York and drain north to Lake Champlain and south to the Hudson River. Sandwiched between the Taconic and the Green Mountains in a narrow band that extends from the Massachusetts border to the Vermont Lowlands is the Valley of Vermont. This valley is divided almost in half by a low ridge from which point it drains north to Lake Champlain and south to the Hudson River.



PHYSIOGRAPHIC REGIONS OF VERMONT

MAP I-I

0 5 10 15 20
MILES

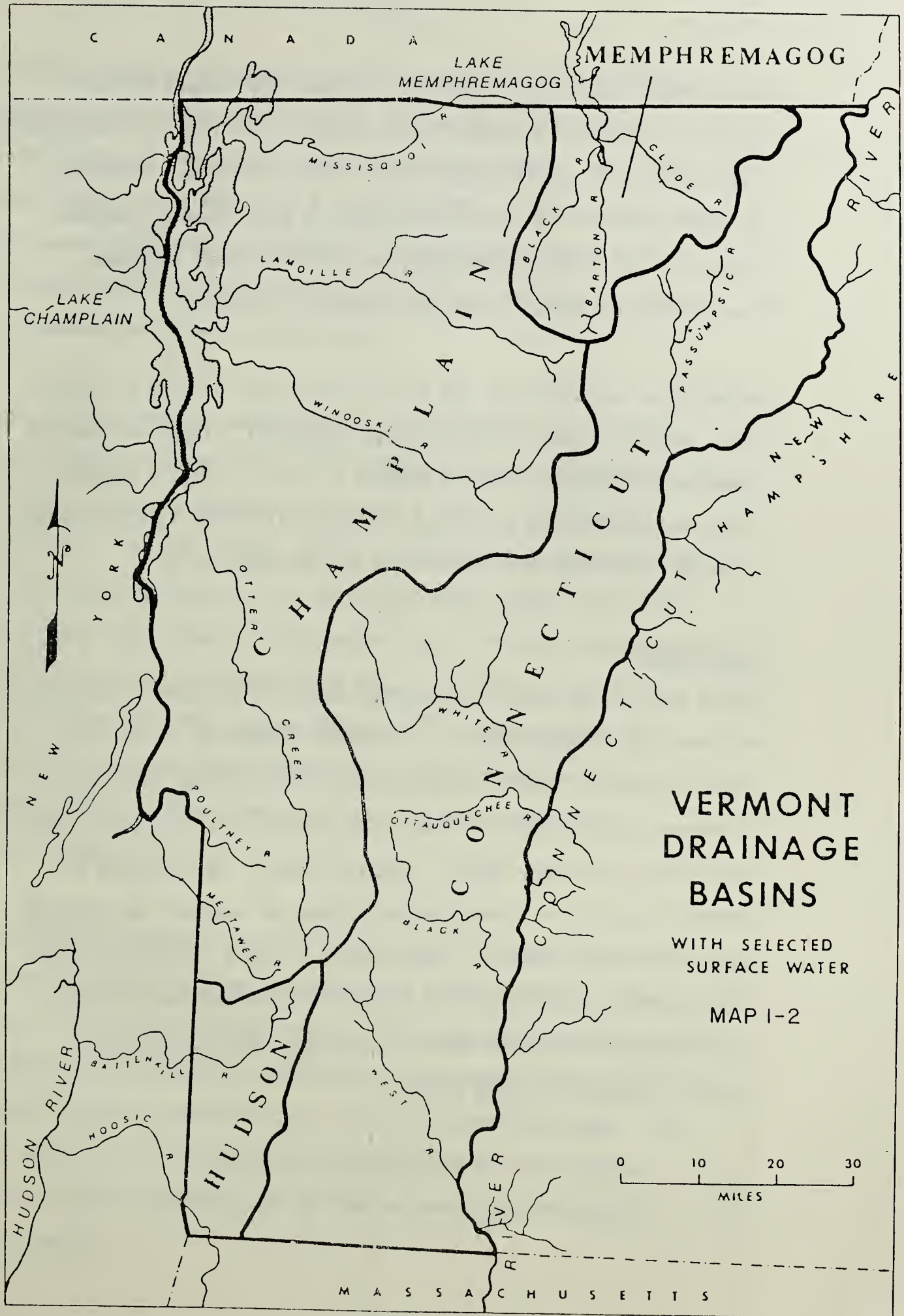
SOURCE : VERMONT GEOLOGICAL SURVEY, 1961

Surface Water Systems

Nearly half of the State, 4,640 square miles, is drained by the Champlain Basin. The Connecticut River Basin drains another 3,928 square miles of the State. However, only fifty-six percent of the entire Champlain Basin and thirty-five percent of the Connecticut River Basin are in Vermont. Small portions of the Lake Memphremagog and Hudson River Basins also extend into Vermont; together they drain 938 square miles of the State. In brief, Vermont's water resources are widespread, abundant, and generally of high quality.

Vermont's two largest surface water systems are the Lake Champlain Basin and the Connecticut River Basin. Lake Champlain, a dominant presence in the most densely populated northwestern part of the State, is 107 miles long and up to 12 miles wide with an average depth in excess of 100 feet and a total area of 490 square miles. Lake Champlain drains north through Canada to the St. Lawrence River via the Richelieu River. The Vermont portion of the Lake Champlain Basin is drained by six major streams -- the Mettawee and Poultney Rivers; Otter Creek; and the Winooski, Lamoille, and Missisquoi Rivers (see Vermont Drainage Basins Map).

The Connecticut River forms Vermont's eastern border with New Hampshire and drains through Massachusetts and Connecticut to Long Island Sound. Its major Vermont tributaries are the Passumpsic, White, Ottauquechee, Black, and West Rivers. Hydroelectric production is an important activity in this basin.



VERMONT DRAINAGE BASINS

WITH SELECTED SURFACE WATER

MAP I-2

The Battenkill and Hoosic Rivers are Vermont's principal surface waters in the Hudson River Basin, draining a small area of southwestern Vermont south through the Hudson River to the Atlantic. Similarly, the Clyde, Barton, and Black Rivers drain a small area of northern Vermont north to Lake Memphremagog and thence through the Magog River to the St. Francis River at Sherbrooke, Quebec.

Vermont also has 280 lakes and ponds twenty acres in size or larger. Public access is made possible through municipal, state, and federal shoreland ownership at some 54 percent of lakes. Some of Vermont's lakes are experiencing accelerated eutrophication due to agricultural activity around the lakes and within the drainage basin.

Ground Water

Ground water in Vermont, like surface water, is abundant, widespread, and generally of high quality. Vermonters depend on it for more than 50 percent of their drinking water, and more than 90 percent of Vermont communities rely totally or in part on ground water for their water need (AEC, 1980). However, due to the character of Vermont's geology, the locations and extent of aquifers and recharge areas are largely unknown. Ground water is found both in fractures of the consolidated crystalline bedrock which underlies the State and within unconsolidated materials (gravel, sand, clay) which mantle the bedrock in most areas.

The best available information on the location of major aquifers indicates that most Vermont aquifers follow the surface water drainageways. A significant sustained aquifer complex runs north-south along most of the State's western border. A similar but less continuous system extends through the central and eastern parts of the State and a significant east-west aquifer corridor runs through the northeastern corner of the State.

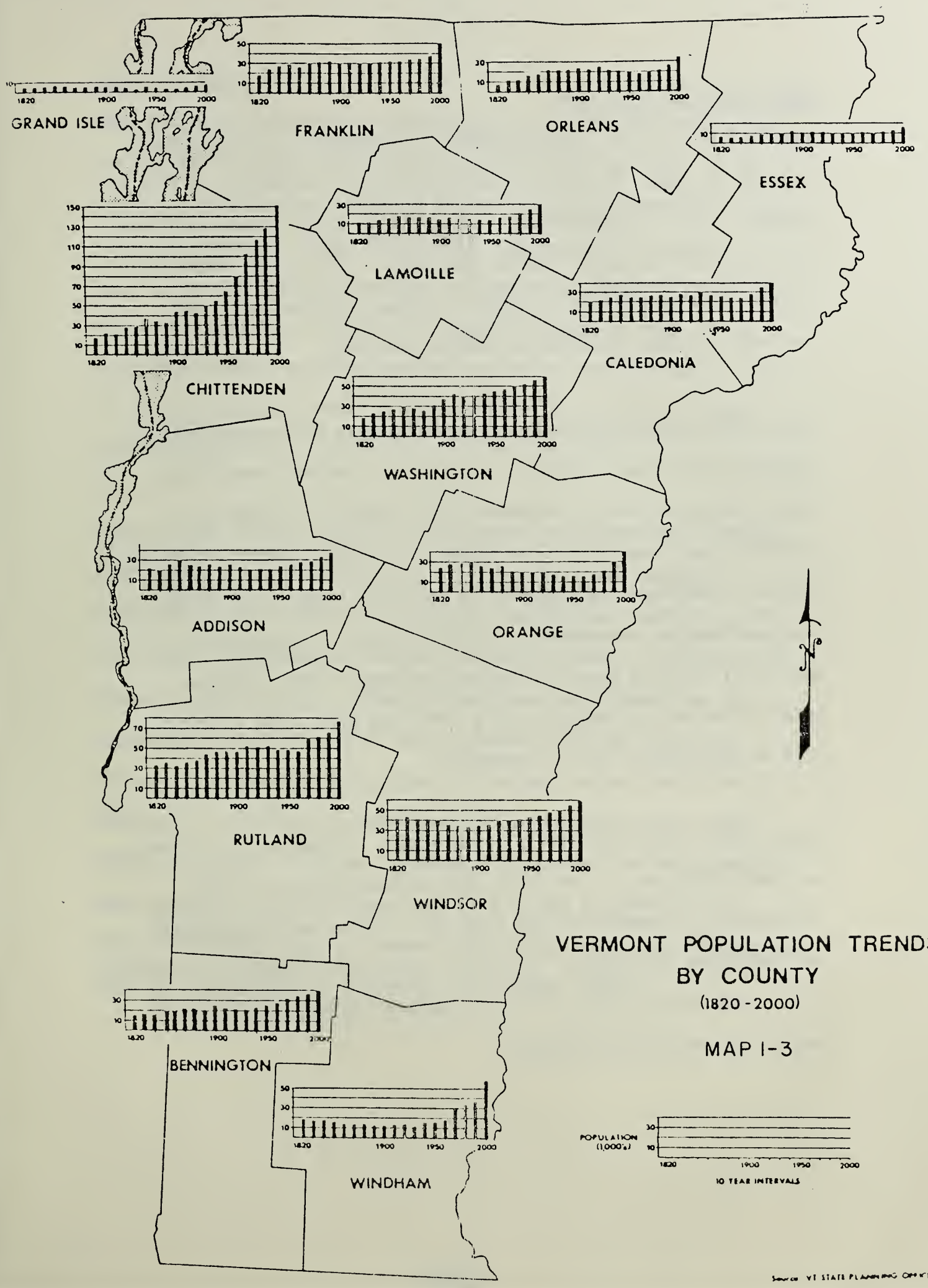
Bedrock wells comprise approximately 70-95 percent of all ground water sources in Vermont and it is estimated that almost half of all these wells are pumped at less than 5 gallons per minute. Despite the fact that bedrock wells far outnumber those drilled in unconsolidated aquifers, it is the latter which supply almost all the ground water needed by high volume users. Properly located and constructed gravel wells can yield water at rates more than 50 times greater than the average bedrock well. Approximately 20 of Vermont's larger sized communities utilize ground water from unconsolidated aquifers for all or part of their water supply needs. (AEC, 1980).

The quality of Vermont's ground water is generally good and potable water can be obtained from the subsurface almost anywhere in the State. Some natural ground water quality problems do exist, however, and include objectionable concentrations of hardness, iron, manganese, sodium, chlorides, sulfur taste or smell, or dissolved gases. They have a minor role in affecting the State's use of the resource. However, various practices of man can and have degraded ground water quality.

Population Growth

Vermont's 1980 population is projected to increase by about 25 percent in the next 20 years, with nearly a quarter of the total population concentrated in Chittenden County. Several of the smaller counties (Orange, Essex, Grand Isle, Lamoille) are expected to experience population increases of 60 to 70 percent (see Vermont Population Trends Map). Despite this projected growth, Vermont will still be, for the most part, a rural state in the year 2000. Chittenden will be the only county of more than 100,000 people, and Burlington, the State's largest city, will have a population of about 40,000, (VSPO, 1978). Vermont's economy will grow with its population, but the economic activities of importance in the year 2000 will probably be similar to the ones of importance today. Thus the basic character of Vermont's communities and economy is not expected to change substantially over the next 20 years. Nevertheless, increasing pressure on the State's water resources from population and economic growth will result in more frequent and more severe water-based conflicts within the State.

* Adapted from UVM, 1980.



VERMONT POPULATION TRENDS BY COUNTY

(1820 - 2000)

MAP I-3

POPULATION (1,000's)

10 YEAR INTERVALS

Source: VT STATE PLANNING OFFICE

Rural and Urban Water Use

Urban and rural water use for domestic, commercial, and agricultural purposes was about 75 mgd or about 25 percent of total use in 1975 (Viesman, 1980). Approximately 400 community water systems and over 60,000 springs and wells provide this water. This large number of individual wells and small community systems creates logistical problems for water resource management programs.

Small water systems generally are known to have more water quality problems than larger systems as a result of limited funds, less sophisticated methods of treatment, less rigorous maintenance schedules, and fewer trained personnel. The large number of small, discrete watersheds and aquifers in the State further complicates the comprehensive management of drinking water. Consequently, the quality of drinking water in Vermont may range widely from one locality to the next despite the efforts now being made to ensure safe drinking water for all Vermonters.

Agricultural water withdrawals are minimal. Irrigation took place on some 1,600 acres of row crops and improved hayland in 1977. Irrigation of strawberries and orchards is occasionally practiced for protection from frost. Potential exists for additional irrigation in the Connecticut Valley and the Champlain Valley, especially on Grand Isle and the Hero Islands.

Water and Energy

From 1950 to 1970 Vermont's total water use hovered around 100 mgd, but by 1975 increased electric production within the State at the Vermont Yankee Nuclear Plant had boosted water use dramatically to more than 300 mgd. Since 1975, nearly 70 percent of Vermont's total water use can be attributed to cooling at electric production facilities, (Viesman, 1980). This recent pattern of water use is a departure from historical patterns of use within the State, and it results because Vermont is neither heavily populated nor heavily industrialized.

This pattern of water use also illustrates the considerable impact which energy production may have on Vermont's water resources. There is renewed interest in hydropower development spurred by the unfortunate dependence of Vermont and the Northeast on increasingly expensive imported oil. Although hydropower development has the potential for providing less than 10 percent of the additional electricity needed by New England in the next decade, more than 60 hydropower projects were under serious consideration within the State as of 1980. Eighteen of these projects are new impoundments. Such development of hydropower may be expected to conflict with other traditional uses of Vermont waters like recreation, fisheries, and the assimilation of treated waste. (NERBC, 1980).

Water for Manufacturing

Manufacturing accounts for about 20 percent of the jobs in Vermont and nearly 30 percent of the Gross State Product of $3,612 million; more than any other single sector of the economy. In 1975 Vermont's self-supplied industrial water use was about 15 mgd or only 5 percent of total use. This small volume reflects both the rural character of the State and the predominance of small industries which rely on municipal water supplies. Thus total industrial use is actually somewhat greater than 15 mgd. Nevertheless, it is not the quantity of industrial water use which is the major concern so much as the impact which the discharge of toxic or oxygen demanding substances may have on water quality. Most Vermont industries are not causing serious water quality problems either because their waste is innocuous or because it is being properly treated. However, there is concern about toxic wastes from the processing of metals, the manufacture of batteries, and the use of solvents in printing and dry cleaning, as well as about the improper disposal of oxygen demanding whey from the manufacture of cheese.

Water and Land Use

Land use, like water use, has a significant influence on the quality and quantity of Vermont's water resources. Runoff from agricultural lands, urban and suburban areas, roadways, and construction sites has resulted in substantial degradation of surface waters and some degradation of ground waters. Vermont's hilly terrain and often shallow, erodible soils increase the seriousness of land runoff. More nutrients frequently enter lakes and streams from land runoff than from municipal and industrial discharges. Manure spreading,

application of chemical fertilizers and pesticides, and soil erosion are major sources of pollution from agricultural lands in Vermont.

As Vermont towns grow, as new areas are developed, and as agriculture continues, the control of land runoff through appropriate land use practices will be an important concern and a significant challenge.

Increased flooding due to more and accelerated runoff from development and encroachment into flood plains and the filling of wetlands is another result of the dynamic relationship between land use and water resources. Not only does development within flood plains risk the loss of property and life to floods, but it also increases the intensity of floods when they do occur by accelerating runoff and reducing infiltration. After the 1927 Flood, the management of flood-prone areas became a statewide concern. Serious floods occurred in 1936, 1938, and 1947. By 1951 a compact with neighboring states had formed the Connecticut River Flood Control Commission to manage the flooding of the Connecticut River and its tributaries through impoundment. Once again in 1973, Vermont suffered serious flooding, especially in upland areas. Currently, with average annual flood damages of 35 million dollars, a significant number of Vermont communities which have had special flood hazard areas identified are still not participating in the National Flood Insurance Program which regulates development in flood-prone areas.

Economic pressure on Vermont farmers and landowners to convert agricultural lands to other uses, notably residential development, is another land use issue with important consequences for water resources. Between 1945 and 1969 some 51 percent of Vermont's farmland went out of production. The loss of these lands and the preservation of those which remain is vital to Vermont's water resources because agricultural lands often occupy flood plains and aquifer recharge areas, providing natural protection and ground water replenishment. In addition to these specific water related concerns, the loss of Vermont's agricultural lands means the loss of food producing capacity, and of unique aesthetic and cultural characteristics like those suggested by such slogans as: "Vermont -- It's a Way of Life."

Recreation and Aesthetics

Both the quantity and quality of water are important to recreational uses such as swimming, fishing, and boating. Although quantity is not typically a water problem within the State, the development of additional hydropower, as noted above, and the artificial regulation of water levels being considered for Lake Champlain and practiced in Lake Memphremagog may conflict with a variety of recreational uses and have adverse effects on fish and wildlife habitat. Water quality is also affected by hydropower because the low flows which can result from impounding waters reduce the capacity to assimilate waste.

Vermont's natural beauty and relatively unspoiled environment are valued highly by Vermont residents and are a prime attraction for visitors. The economic importance of tourism and recreation, a 27 million dollar industry in the Lake Champlain area alone, further underscore how vital a healthy and clean environment is to Vermont's people and future, (Gilbert, 1977). Maintaining and improving the quality of water resources is essential for achieving the environmental quality which Vermonters expect and which the recreational and tourist industries depend upon.

Navigation

Lake Champlain is the only navigable water within Vermont that supports significant water transport. Barges carrying primarily petroleum fuels service Burlington and Plattsburgh, New York via the Champlain Canal and Hudson River. Although no major spill has occurred the potential exists from this source for polluting the lake with oil saturated material and other toxics. There are five ferry crossings which provide connections between Vermont and New York.

Water Law

Vermont is a riparian doctrine state, like most jurisdictions east of the Mississippi River. Public and private waters are distinguished by the test of navigability in fact and the public waters are held in trust by the State. As conflicts develop between water uses, the Vermont Supreme Court has applied the key riparian understanding -- riparians, or those who have obtained such a right, have a usufructuary right to make a reasonable use of the waters.

Riparian rights in Vermont are not subject to forfeiture and non-use of the resource does not mean it's a loss. A riparian right may be granted to a non-riparian through a legal conveyance. The concept of riparianism in Vermont extends to the quality of the resource as well as its quantity. Again, reasonableness is fundamental and what is reasonable is a matter to be determined in each case and in terms of each source of water.

In terms of ground waters, Vermont is one of the very few jurisdictions where the doctrine of absolute ownership exists, unless it can be demonstrated that the underground water lies in a definite underground channel in which case the reasonable use doctrine applies.

Beginning in the 1890's, the state and federal governments have gradually extended their authority into the fields of water pollution and the use of surface waters. As the reach of legislative and administrative branches of government has become longer, the role of the courts in resolving water resources issues has diminshed. Aside from deciding an occasional lawsuit to enjoin a public or private nuisance, the courts are limited today primarily to interpreting legislative statutes and reviewing the reasonableness of an agency decision, (Lapping, 1979).

State Water Resources Organizations

Effective June 1, 1970, the Vermont Legislature created the Vermont Agency of Environmental Conservation, (AEC). This "super-agency" consolidated the State's major natural resource departments under the administration of one Secretary. The Agency has broad, statewide responsibility for regulating, planning, and management of water resources

in Vermont and is the principal state agency with which the Soil Conservation Service coordinates its water resources programs. Presently, the Agency is comprised of the following departments:

- Department of Water Resources and Environmental Engineering
- Department of Fish and Game
- Department of Forests, Parks and Recreation
- Division of Protection
- Natural Resources Conservation Council

The Water Resources Board, Fish and Game Board, and the Environmental Board are also attached to the Agency with regulatory and quasi-judicial authority under their respective enabling acts.

The Vermont Department of Water Resources is authorized by statutes to protect, regulate, and where necessary, control the state's water resources to protect the public interest and promote the general welfare. In addition, agency policies and strategies have been defined for specific resource problems such as desilting impoundments, stormwater pollution control, non-point source control, and minimum flow releases from impoundments. These are supplemented by elements of the State Water Quality Management Plan prepared through the 208 planning process on agricultural non-point source control, silvicultural erosion control, septage management, backroads management and the management of on-site wastewater throughout the state. Wetland protection, and protection of streambanks are also current areas of concern to the Department.

While political power is vested at the town level rather than in Vermont counties, regional planning is carried out through 13 regional planning commissions which generally conform to county boundaries. (See Map 1-4). Natural Resources Conservation Districts in Vermont also generally follow county lines. The State's 14 districts are also shown on map 1-5.

Other state agencies which have various responsibilities related to water resources include the Vermont Health Department, the Public Service Department and Board, the State Planning Office, the State Energy Office, and the State Department of Agriculture. The Health Department has specific responsibility for drinking water quality and on-site wastewater disposal; the Public Service Department is responsible for energy planning and management; the Public Service Board sets utility rates and evaluates applications for utilities construction projects such as hydroelectric plants and the proposed wood-burning plant in Burlington; the State Planning Office deals with development patterns and impacts and with land use capability. Numerous private groups such as the Vermont Natural Resources Council, the Connecticut River Watershed Council, the Lake Chmaplain Committee, and Memphremagog Conservation, Inc., are among the many active groups involved in Vermont's water resource issues.

SCALE OF MILES

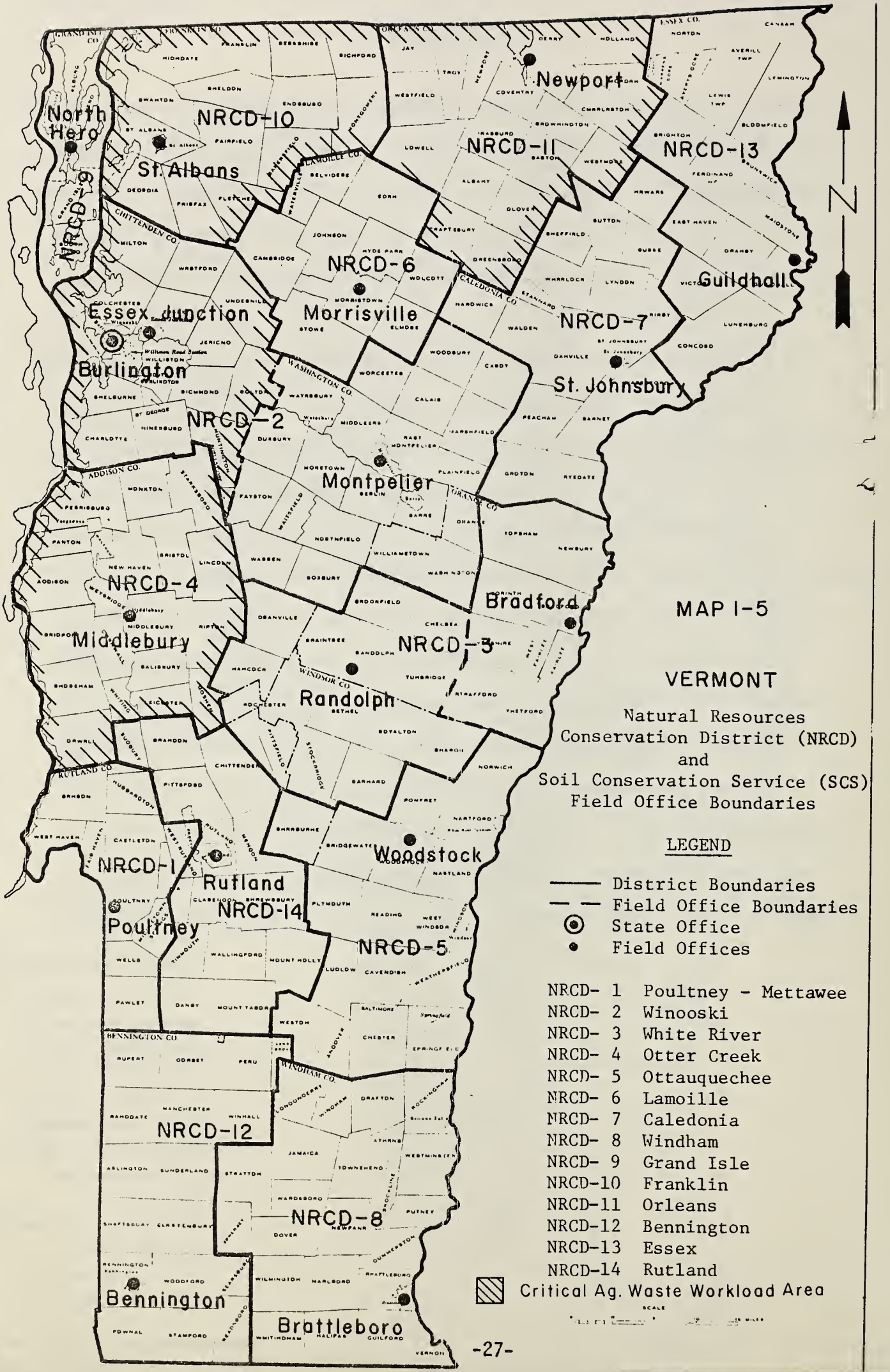
JUNE 1974

MAP I-4

REGIONAL PLANNING COMMISSIONS

1. ADDISON COUNTY (MIDDLEBURY)
2. BENNINGTON COUNTY (ARLINGTON)
3. CENTRAL VERMONT (MONTPELIER)
4. CHITTENDEN COUNTY (ESSEX JUNCTION)
5. FRANKLIN COUNTY (ST. ALBANS)
6. LAMOILLE COUNTY (MORRISVILLE)
7. NORTHEASTERN VERMONT (LYNDONVILLE)
8. OTTAUQUECHEE (WOODSTOCK)
9. RUTLAND (RUTLAND)
10. SOUTHERN WINDSOR COUNTY (SPRINGFIEL
11. TWO RIVERS (SHARON)
12. UPPER VALLEY (LEBANON, N H)
13. WINDHAM (BRATTLEBORO)

VERMONT DEPARTMENT OF WATER RESOURCES



MAP I-5

VERMONT

Natural Resources
Conservation District (NRCD)
and
Soil Conservation Service (SCS)
Field Office Boundaries

LEGEND

——— District Boundaries
— — Field Office Boundaries
◉ State Office
• Field Offices

NRCD- 1 Poultney - Mettawee
NRCD- 2 Winooski
NRCD- 3 White River
NRCD- 4 Otter Creek
NRCD- 5 Ottauquechee
NRCD- 6 Lamoille
NRCD- 7 Caledonia
NRCD- 8 Windham
NRCD- 9 Grand Isle
NRCD-10 Franklin
NRCD-11 Orleans
NRCD-12 Bennington
NRCD-13 Essex
NRCD-14 Rutland

▨ Critical Ag. Waste Workload Area

SCALE

CHAPTER 2

MAJOR WATER RESOURCE PROBLEMS

General

Vermonters prize the waters of their state. In recent years, government, universities, and private groups have quantified and targeted their concerns for several key, often interrelated, water problems.

The Vermont Department of Water Resources and the University of Vermont's Water Resources Research Center have recently analyzed Vermont water problems. While the objectives for their analyses were different the identified problems are strikingly similar.

This more general assessment by the Soil Conservation Service has rearranged the problem priorities for this report considering:

a) national concerns as stated in federal policy documents, and
b) the practicality of applying USDA programs to assist local people and agencies in solving the problems.

The Department of Water Resources List

The major water resource problems needing additional financial resources planning and/or management perceived by the Department are listed in Table 2-1 in two categories, (AEC, 1981). The two categories are: (A) problems for which substantial funds are available or are anticipated from state and federal sources and (B) problems for which limited or no funds are available and for which substantial additional new state or federal resources will be needed to effectively carry out planning and management functions required for problem resolution.

Problems in Category B are listed roughly in their order of importance to aid the reader in understanding how the Water Resources Department ranks the need for additional planning and managing financial resources. The state assigns the highest level of importance to programs described in Category A. Faced with the loss of federal assistance the state would attempt to sustain some minimal level of effort in these program areas.

Table 2-1. Vermont Department of Water Resources - Problem Priorities

Category A

1. Hydroelectric Power Development
2. River Assimilative Capacity and Wasteload Allocation
3. Flood Plain Management
4. Groundwater Pollution
5. Municipal and Industrial Point Source Pollution
6. Permit Program
7. Shoreland Management and Protection
8. Non-Point Pollution
9. Lake Management
10. Acid Rain

Category B

1. Lake Champlain
2. Upland Streams
3. Wetlands
4. Streambank Management
5. Urban Stormwater
6. Water Conservation

The University List

In order to establish water research priorities, the University of Vermont's Water Resources Research Center reviewed ongoing management and planning efforts and literature, and has surveyed individuals knowledgeable about Vermont's water resources, (UVM, 1980). University researchers and resource managers from state and federal agencies responded to a series of questions on Vermont's water resource management problems. These individuals were asked to provide five brief statements describing the water resource management problems they perceived to be of greatest importance to Vermont's future. The issues most frequently identified (in descending order) are presented in Table 2-2. These individuals were next asked to rank a number of water impact activities in order of their importance as factors which may significantly affect the future of Vermont's water resources. This ranking is presented in Table 2-3. Agricultural runoff was rated as a most important management problem and is clearly perceived as a persistent and significant water quality problem for Vermont. In a second survey, university researchers and resource managers rated the severity of the 11 water resource problems. The results are shown in Table 2-4.

Table 2-2. Water Resource Management Problems

1. Allocation of water resources
2. Land runoff
3. Groundwater management
4. Wastewater treatment
5. Hydropower development
6. Acid precipitation
7. Lake management
8. Drinking water quality
9. Inadequate data base
10. Wetlands protection
11. Toxic waste management

Table 2-3. Activities Which Impact on Vermont's Water Resources

1. Land development
2. Agriculture
3. Industrial and energy production activities
4. Municipal/commercial activities
5. Individual households
6. Forestry
7. Recreation
8. Fish and wildlife management
9. Navigation

Table 2-4. Severity of Water Resource Management Problems

	Critical	Important	Low Priority	Rank
Ground Water	60.9%*	39.1%	0.0%	1
Toxic Waste	47.8%	52.2%	0.0%	2
Wastewater Treatment	43.5%	56.5%	0.0%	3
Data Base	45.8%	50.0%	4.2%	4
Allocation Issues	52.2%	30.4%	17.4%	5
Lake Management	34.8%	65.2%	0.0%	6
Hydropower Development	41.7%	50.0%	8.3%	7
Land Runoff	31.8%	59.1%	9.1%	8
Wetlands	33.3%	54.2%	12.5%	9
Acid Precipitation	26.1%	65.2%	8.7%	10
Drinking Water	26.1%	60.9%	13.0%	11

*% of responses

The SCS Assessment's List

As a result of this assessment, the most important water problems currently facing Vermonters are:

- Surface water pollution
- Eutrophication of lakes and ponds
- Flooding
- Cropland erosion
- Ground water contamination
- Stream flow allocation
- Acid precipitation
- Water-oriented outdoor recreation
- Shoreland Management
- Wetlands
- Streambank erosion and management

The symptoms of these problems are sometimes obvious, but more often are hidden from public view. A brief discussion of these problems, their causes and effects, follows.

Surface Water Pollution

Fishing and swimming in Vermont rivers are moderately hampered by localized surface water pollution from community and industrial discharges. Runoff from urban, agricultural, and forested areas also contribute pollutants, especially coliform bacteria, sediment, and nutrients which violate state water quality contact recreation (Class B) standards. While stream pollution is found in all major basins, more than 60 percent of the water quality violations occur in the Connecticut River Basin, with the upper Connecticut River from Ammonoosuc River to Comerford Dam the most serious problem area, (AEC, 1980).

Vermont has over one-half (197,000 of 381,000) of the dairy cows in New England. Of the nearly 4,500 Vermont farms with cows, 1,600 are small (less than 30 cows) and most likely do not need an animal waste system. About 400 Vermont dairy farms have installed manure systems, with another 350 soon to be installed through watershed project operations. This leaves some 2,150 dairy farms in need of manure management assistance, over half of which are in the four targeted counties and suspected to be major contributors to river and lake eutrophication problems in Lakes Champlain and Memphremagog. Manure management needs statewide are shown in Table 2-5.

Table 2-5. ANIMAL WASTE MANAGEMENT NEEDS IN VERMONT COUNTIES - (1981 ESTIMATE)

County	No. Cows (EA)	Rank-Cows	Cropland Harvested (AC)	No. Farms w/cows (EA)	Est'd. No. Farms w/cows w/man Storage (EA)	Est'd. No. Farms w/cows Scheduled for man Storage w/Proj.(EA)	Est'd. No. Farms w/under 30 cows	Needs 4-(5+6+7)	Priority/ Needs Rank
STATE	197,243	-	506,016	4,477	393	350	1,574	2,160	
Addison	34,194	2	108,702	577	55	120	118	284	2
Bennington	3,717	13	11,596	127	10	-	65	52	10
Caledonia	12,403	7	33,102	321	30	-	145	146	9
Chittenden	16,430	4	44,834	328	25	80	90	133	5
Essex	2,475	14	5,883	57	5	-	25	27	14
Franklin	37,676	1	72,415	674	65	80	160	369	1
Grand Isle	4,304	12	15,447	109	10	-	41	58	8
Lamoille	7,453	10	16,071	162	19	-	55	88	6
Orleans	25,015	3	56,970	495	45	70	107	273	3
Orange	14,718	6	32,855	418	40	-	195	183	11
Rutland	16,115	5	44,979	417	20	-	172	225	4
Washington	8,622	9	22,577	264	19	-	132	113	7
Windham	6,035	11	15,459	175	15	-	86	74	13
Windsor	8,626	8	25,176	353	35	-	183	135	12

Source: USDA, 1981.

Fifty percent of Vermont's population resides in rural areas where the only feasible means of controlling domestic pollution is through the construction of septic tanks and leaching fields. Concerted efforts in the past have resulted in substantial abatement of these individual discharges. Approximately 30,000 septic tanks have been installed in rural Vermont since 1970. Natural Resource Conservation Districts and Environmental Agency Regional Offices now provide direct technical assistance to individual rural homeowners in the siting, design, and construction inspection of on-site subsurface disposal system. The State plans to call for an expansion of the District's On-site Sewage Disposal Program as Vermont's approach to pollution abatement from septic system failure.

Increased development pressure at ski areas, residential, commercial and other activities located in upland areas are threatening the quality of upland streams. Present State rules (Rule 12) disallow new or increased discharges to upland streams. The quality of these areas is now high and extremely sensitive to water quality degradation.

Urban stormwater runoff and combined sewers are also suspected sources of pollution in Vermont. Without additional information, the magnitude of the problem and degree of treatment needed to correct the stormwater problem remains uncertain. While all new stormwater discharges must now be issued temporary pollution permits, the State plans more evaluation work over the next three years as a basis for State policy and regulatory action. Major combined sewer overflow problems occur in 14 Vermont communities in the Champlain, Memphremagog and Connecticut basins. The specific impact of these overflows on water quality has not been documented. Low funding priority for sanitary/storm sewer separation has resulted in little progress to rectify this problem, (AEC, 1980).

Oil and hazardous material spills in Vermont periodically pollute streams and groundwater with chemicals. In 1979, there were 146 reported spills, of which 73 reached the surface waters and 19 reached the groundwater. Hazardous material accidents occur throughout the State and are handled as environmental emergencies by the State Agency of Environmental Conservation in cooperation with fire service organizations. The State monitors and advises the responsible party on spill control, cleanup and disposal of contaminated material. Sites for the proper disposition of oil saturated debris, possibly using landforming, are being sought in towns near Lake Champlain.

Eutrophication of Lakes and Ponds

Human activities are accelerating the delivery of phosphorus and other nutrients to Vermont's waters beyond the discharges of municipalities and industries. Nutrients are also coming from manure and dairy wastes, along with sediment and nutrients from cultivated cropland, construction activities, highways, logging areas and streambanks. Vermont's primary non-point source problem is the accelerated aging process (eutrophication) of parts of Lake Champlain, Lake Memphremagog, and several smaller lakes and ponds caused by the introduction and build-up of excessive nutrients. Vermont has classified its lakes by combining existing water quality and biological data with land use activity data to rank Vermont lakes for lake restoration and lake protection purposes. Forty-four (44) Vermont lakes have been classified as needing lake restoration to solve existing eutrophication problems. Agricultural activity, especially intensive cropping and manure management, is a suspected source of phosphorus and sediment for many of these lake basins, (See Table 2-6). Further analysis of the impact of changes in such land uses on lake eutrophication is planned during late 1981 and 1982 by the Vermont Department of Water Resources.

Table 2-6. Vermont Lake Restoration Priorities* and Associated Agricultural Land Use in 1978.

	Percent Total Drainage Basin in Agriculture	
Lake Name - Town	Tilled	Untilled (Pasture, Grassland)
Lake Carmi-Franklin	12%	22%
Cedar Lake-Monkton	13%	15%
Curtis Pond-Calais	2%	6%
Lake Elmore-Elmore	2%	3%
Fairfield Pond-Fairfield	3%	5%
Harvey's Lake-Barnet	1%	6%
Lake Hortonia-Sudbury/ Hubbardton	1%	4%
Lake Iroquois-Hinesburg	8%	21%
Lake Morey-Fairlee	1%	1%
Lake Parker-Glover	1%	1%
Lake St. Catherine-Poultney	1%	3%
Shelburne Pond-Shelburne	16%	35%
Star Lake-Mt. Holly	1%	2%
Lake Winona-Bristol	3%	13%
Lake Champlain	N/A	N/A
Lake Memphremagog	N/A	N/A

* This does not include those lakes which do not have significant public access and use.

N/A - Not Available

Since 1974, Vermont has supplemented its point source pollution control program with detailed studies and aggressive planning for control of nonpoint sources of pollution to protect and restore where feasible, the quality of Vermont lakes. Projects to provide financial assistance to landowners to control land runoff from agriculture are now underway in Shelburne and St. Albans Bay drainage areas, and in Lake Parker. Planning is well underway for additional implementation projects in Lake Carmi, the Black River Basin, the Otter Creek Basin, and the Winooski Basin. Based on the severity of water quality problems, Vermont established the following priority order of lake watersheds for implementation of best management practices through cost sharing and other assistance programs.

1. St. Albans Bay/Lake Carmi Drainage Areas
2. Black River/Lake Parker Drainage Areas
3. Shelburne Bay Drainage Basin
4. Otter Creek Drainage Area
5. Winooski River Drainage Area
6. Barton River Drainage Area
7. Lamoille River Drainage Area
8. Missisquoi River Drainage Area
9. Clyde River Drainage Area

For the next five years, the focus in Vermont nonpoint source work will be on plan implementation for agricultural pollution control. Forestry runoff impacts will also be addressed as large increases in timber harvesting for fuelwood and local energy production are anticipated in the state.

Flooding

One of Vermont's most pressing water problems is the danger of loss of life and property as a result of floods. Flooding periodically occurs on some 2,000 miles of major streams and 4,000 miles of minor streams and tributaries. Some 3.5 percent of the state's land, over 200,000 acres, are prone to flooding. The state's flood plains are intensively developed now in some areas, and contain some of the most highly prized land for future development. Vermont's major floods have resulted either from excessive rainfall, runoff from snowmelt or from a combination of the two causes. While spring is the common flood season, each season of the year has recorded flood damage.

In 1973 and again in 1976, flood damages to public facilities (roads, sewage treatment plants, buildings, etc.) neared $13 million and $8 million respectively. Damage to private property was estimated to be at least 25 percent of the public damages. Four people lost their lives as a result of the 1973 flood. From the early 30's to the early 70's flood control structures and local protection projects were the mainstay of Vermont's flood damage abatement program. The U.S. Army Corps of Engineers dominated the program, with a small

watershed protection project in the Connecticut River Basin under the U.S. Soil Conservation Service, also prominent. However, objections to flood control structures in Vermont have become stronger, and these structures do nothing to prevent flood damage increases due to flood plain encroachment. Consequently, Vermont is presently developing, pursuant to State legislation, a comprehensive flood plain management program which emphasizes preventive measures by providing technical assistance and public education to communities.

This effort parallels and complements the National Flood Insurance Program. In order to manage flood plains wisely, and qualify for flood insurance many Vermont communities are still in need of hydrologic studies which delineate the extent of their flood hazard area. Table 2-7 lists these communities in priority order and their associated major river basin.

Cropland Erosion

Cropland erosion can be considered a water resource related problem because,

a) Most of the erosion is associated with surface water runoff,

b) The resulting runoff of sediments and nutrients frequently reduces water quality downstream, and

c) Practices which reduce surface water runoff are effective in reducing erosion rates.

Cropland erosion is also a problem for agricultural production. Crop yields tend to decrease and cultivation costs tend to increase as topsoil is lost from cropland fields.

Previous studies indicate that about 32 percent of the 271,000 acres of cultivated cropland in Vermont are losing soil at rates which exceed the estimated soil regeneration rates. These estimates are for present conditions with typical cultivation practices in the state.

Based on these estimates and typical sediment delivery ratios, cropland sheet and rill erosion accounts for about 200,000 tons of sediment leaving Vermont annually.

Groundwater Contamination

Vermont has documented very few cases of groundwater contamination. Almost all the known cases are the results of pollution levels that were so gross they were obvious to people using the water. Except for reported spills, contamination had already migrated from its source into someone's drinking water before the problem was noticed. In some cases the ground water had apparently been contaminated for years. Vermont has completed an inventory of potential pollution sources and community ground water supply wells which will be updated regularly, (AEC, 1980). Over 2,800 potential contaminated sites, including 189 agricultural waste lagoons, were inventoried and mapped in conjunction with existing aquifer areas, illustrating the potential for ground water contamination for each Vermont town, (AEC, 1980). Other potential pollution sites include the following:

Waste Disposal Sites

- Liquid Waste to Land Surface (Spray irrigation or land application) - 17 sites
- Solid Waste (landfills and known dumps) - 336 sites

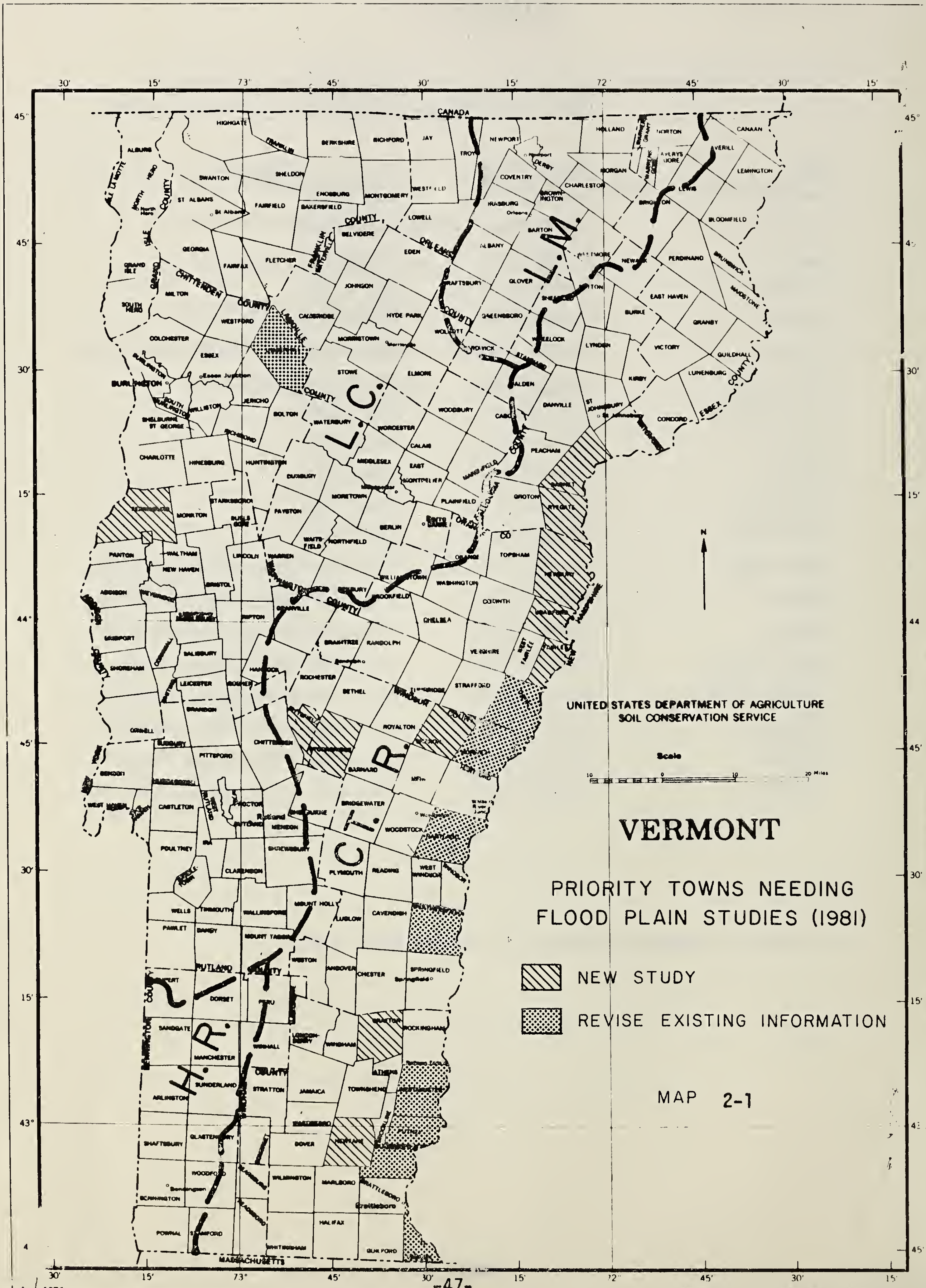
Toxic, Hazardous or Potential Contaminant Sites

- Petrochemical (Chemicals, Fuels, Pesticides) - 1732 sites
- Agricultural Waste Lagoons - 189 sites
- Junkyards, Salvage Yards - 97 sites
- Municipal Waste Lagoons - 76 sites
- Industrial Waste Lagoons - 73 sites
- Salt/Salted Sand Storage - 335 sites

Table 2-7. Priorities for Detailed Flood Plain Studies in Vermont*

Town	Major Basin	Comments
Grafton	Connecticut	New Study
Bradford	Connecticut	New Study
Newbury	Connecticut	New Study
Fairlee	Connecticut	New Study
Ryegate	Connecticut	New Study
Barnet	Connecticut	New Study on Connecticut River
Pittsfield	Connecticut	New Study
Stockbridge	Connecticut	New Study
Sharon	Connecticut	New Study
Newfane	Connecticut	New Study
Vergennes	Champlain	New Study
Ferrisburg	Champlain	New Study
Dummerston	Connecticut	Existing Study needs revision
Vernon	Connecticut	Existing Study needs revision
Putney	Connecticut	Existing Study needs revision
Westminister	Connecticut	Existing Study needs revision
Weathersfield	Connecticut	Existing Study needs revision
Hartland	Connecticut	Existing Study needs revision
Norwich	Connecticut	Existing Study needs revision
Thetford	Connecticut	Existing Study needs revision

* Listed in priority order as of January 1982, AEC.



April 1976

Source Data U.S. Geological Survey 1:500,000 Base Map

Stream Flow Allocation

Some Vermont streams are straining from the mounting pressure of more people and more hydroelectric energy development. Table 2-8 lists Vermont rivers which could now or in the near future have significant dissolved oxygen deficits below treated waste discharge sites. The waste assimilation capacity of these stream segments will be distributed among the present discharges to the rivers. The Vermont Department of Water Resources has adopted a wasteload allocation process and is conducting water quality studies necessary for the allocations in Otter Creek near Rutland, Stevens Branch of the Winooski River near Barre City, and the Lower Winooski River. In the future, allocations of nutrients (especially phosphorus) may also be necessary in those segments where lake eutrophication is serious.

The flows of Vermont's rivers are also being eyed for their hydro-electric power potential. The Agency of Environmental Conservation is presently responsible for reviewing 58 proposed hydro projects, 14 of which are proposed new dams. Table 2-9 shows the names and locations of the proposed new dams. Most of the projects would generate peaking power by storing the river's flow and releasing it during a short period. The Agency feels the following evaluations are necessary for proposed hydro projects: (1) appropriate minimum flows for protecting the river's assimilative capacity to take up treated wastes; (2) the effect of dams on fisheries habitat (migration, spawning, juvenile and adult); (3) effects on recreation and aesthetics; (4) the effects of desiltation on water quality; and (5) the effects of the impounding water in pools on water quality and on flood states, (AEC, 1981).

Table 2-8. Waters Requiring Additional Water Quality Studies for Determination of Future Assimilative Capacity Capabilities

1980 Order of Priority	River Basin -	Segment	Description	Present Modelling Status
1	Winooski River	Main Stem (8-6)	Below discharge from IBM to confluence with Lake Champlain.	Calibration and Verification Data Complete-Load Allocation Being Assigned.
		Stevens Branch (8-9)	Below discharge from Barre City to confluence with Winooski River.	Calibration and Verification Data Complete-Load Allocation Being Assigned.
2	Otter Creek	Main Stem (3-3)	Below Rutland City discharge to confluence with Lake Champlain.	Calibration and Verification Date Complete-Load Allocation Being Assigned.
3	Connecticut River	Main Stem	Upper Ammonoosuc to Comerford Dam.	Verification
4	Walloomsac River	Main Stem (1-4)	Below discharge from Bennington to New York State Line.	Calibration Data Complete.
5	Poultney River	Main Stem	Poultney to the Castleton River.	
6	Hoosic River	Main Stem (1-2)	Below Pownal to Tannery to New York State Line.	
7	Lake Champlain	LaPlatte River	Below discharge from Hinesburg to Lake Champlain.	

Source: AEC, 1980.

Table 2-9. New Dams Proposed for Hydropower Development in Vermont (as of July 1981)

Name	Champlain Basin Stream	Town
Chace Mill	(Lower) Winooski River	Winooski, Burlington
Batchelder	Winooski River	Plainfield
East Georgia	Lamoille River	Georgia, Fairfax
Frog Hollow	Otter Creek	Middlebury
Missisquoi Hydro	Missisquoi River (3 sites)	Troy, Enosburg, Sheldon, Highgate, Jay
Richford	Missisquoi River	Richford

Name	Connecticut Basin Stream	Town
West River Hydro	West River	Jamaica, Townshend, Dummerston
Hart Island	Connecticut River	Hartland
Saxtons River Project	Saxtons River	Rockingham
Brockway Mills	Williams River	Rockingham
Ruhl Dam	Cold Brook	Wilmington
Magnus	Peacham Hollow Brook	Peacham

Acid Precipitation

Vermont lakes, especially those at elevations 2,000 feet above mean sea level, have been found to be sensitive to the effects of highly acidic precipitation. Acid precipitation is suspected to originate primarily from the combustion of fossil fuels by major industrial and energy developments in midwestern states such as Illinois, Indiana, and Ohio. Vermont has been surveying lake conditions since 1969. Precipitation pH data is also being collected. Present data indicates the most sensitive Vermont lakes are located in the southern Green Mountains (Bennington and Windham counties), and northeastern Vermont (Essex and Orleans counties). Lake of the Clouds, near the summit of Vermont's highest mountain at elevation of approximately 3,950 feet m.s.l. is also highly sensitive. With a mean pH of these lakes less than 5, significant alterations of aquatic biological communities may already have occurred. The Department of Water Resources, the University of Vermont, and others are actively pursuing monitoring programs and further research on this important problem. At the same time, interstate cooperation and adequate air emission controls appear essential to reduce sources of acid deposition reaching Vermont.

Water Oriented Outdoor Recreation

Vermont has the image and attraction of a recreation state. Vermont's attractiveness is closely tied to its physical beauty and the high quality of her natural resources. The state's surface waters are highly prized and essential in meeting many of the state's summer and winter leisure time demands. In 1978 Vermont conducted a survey to determine the popularity of recreational activities which require lands or facilities for their enjoyment. Table 2-10 clearly demonstrates the direct role of Vermont's lakes and streams in summer recreational enjoyment. Ice fishing in the winter is also popular on Vermont lakes and ponds.

Table 2-10

Summer Recreation Participation

In Water-Oriented Activities

Activity	Popularity Rank (20 activities ranked)
Pool Swimming	1
Pond Swimming	3
Fishing	6
Motor Boating	10
Canoeing	16
Sailing	17

Source: AEC, 1980

Vermont's recreation lands and facilities are shared by public, quasi-public and private landowners. The SCORP inventory of public and private facilities was conducted in 1977 documented and mapped most of the state's recreational resources with this data in hand, and with local input future recreational needs were defined for the entire state and for nine sub-state regions. The 1980 SCORP Report should be consulted for specific information on district recreational needs. Overall, however, the state's strategy for meeting major water recreation needs include the following.

- Resource protection of primary natural areas as well as natural wetlands;

- Protection and development of riverways as part of municipal and regional open space systems. (Major multi-use riverways include Connecticut, White, Lamoille, West, Winooski and Otter rivers).

- Facility development and improvement of facilities to meet day use demands (priority needs include acquisition and development of shoreline frontage, beaches, streambank fishing access sites, and boating access sites.

- Urban and neighborhood amenities program; including wise use of flood hazard areas for recreational use.

- Coordination of public investment including improved communication among state, local and federal agencies to assure the best use of limited public funds to help meet recreational needs.

With the elimination of funding of the U.S. Department of Interior's Land and Water Conservation Fund, there is an even greater need for SCS to participate with state and other federal agencies in their efforts to acquire, develop and manage Vermont resources.

Shoreland Management on Vermont Lakes

Vermont lakes are major recreational resources supporting a multi-million dollar tourist and local economy. Further, shorelands are among Vermont's most prized residential development lands for both seasonal and year-round uses. Inappropriate use of shoreland areas results in poor water quality, elimination of fish and wildlife habitat, public health and safety hazards from flooding and shoreline erosion, and other adverse impacts. To date, lakeshore zoning bylaws have not been widely adopted to protect and manage shoreland resources. Flood and erosion damages, as well as water pollution due to unwise management could increase in the future.

The AEC supports developing an education program on shoreland protection and management which is suitable for all Vermont lakes.

On Lake Champlain, further evaluation of serious shoreline erosion problems, alternative solutions and development of a local protection strategy for critical erosion stretches is viewed as an important component of an overall shoreland protection program.

Wetlands

Vermont has some 100,000 acres of wetlands which represent an important natural resource. They contain extensive wildlife and fisheries resources, including migrating waterfowl, marsh birds, other water birds, furbearers, and various game, non-game and forage fish.

Agricultural, residential, commercial and industrial development are the major human activities disrupting wetlands. Other activities effecting these areas include wildlife habitat modification for state waterfowl management, recreation complexes, and power-line and road construction. Wetlands which are most affected by development pressures tend to have gentle slopes from the terrestrial to the wetland environment. These are often agricultural lands, which are cropped or in pasture. Management opportunities are available through several federal programs, including USDA's Water Bank Program. However, the Water Bank Program in Vermont is not extensively used by landowners. At the state level, Vermont has no state wetlands protection law despite several years of consideration. Legislative committees have requested the AEC to determine how best to accomplish wetlands protection in Vermont in anticipation of legislative action in 1982.

Streambank Erosion and Management

Streambank erosion threatens public and private property by undercutting, deposition, and defilement. It pollutes streams with sediment and adds to maintenance costs of flow crossings and highways. In addition, these critical areas expand in size and grow in numbers as the weaker segments of streams, banks, and slopes are stressed by rainfall and runoff. Damage is increased by water-borne ice or debris.

The end product is the sediment that fills the streams and lakes, increases flooding, smothers crops, and spoils the habitat for fish and wildlife. Sediment also effects municipalities by increasing the cost of filtering and processing water for municipal and industrial uses.

The flooding that occurred in Vermont in 1973 and 1976 caused millions of dollars in damage to streambanks. Repair of the damage was a monumental task requiring over 7 million dollars of federal funds alone, including substantial inputs through SCS.

There are an estimated 450 miles of eroding streambanks in the state in need of attention. Treatment measures consist of shaping and establishment of vegetation, and in many cases filling the eroded areas with rock riprap, cribbing, or other structural means.

CHAPTER 3

USDA WATER RESOURCES CONSERVATION PROGRAMS IN VERMONT

SCS Today

The mission of the U.S. Department of Agriculture'S (USDA) Soil Conservation Service covers three major areas: soil and water conservation, rural community resource protection and development, and natural resource surveys. SCS works in every Vermont town by assisting 14 Natural Resources Conservation Districts, which are subdivisions of State government. Under Vermont law, each district is legally responsible for soil and water conservation work within its boundaries. Each district has a locally elected board which carries out a long range conservation program in their district. SCS in Vermont has assigned District Conservationists and staff planners and technicians to assist the districts and its cooperating land users. To qualify for most kinds of technical help, landowners sign a cooperative agreement with their district. There are now over 12,000 Vermont "cooperators" voluntarily applying conservation measures to their land with SCS assistance. Nearly one-quarter of Vermont's land area is covered by their conservation plans. Financial assistance is available to landowners, groups, and communities under various programs from USDA's Agricultural Stabilization and Conservation Service (ASCS), Farmer's Home Administration, as well as SCS. A long range plan to meet soil and water conservation needs in Vermont districts is currently being prepared.

Today, the heart of Vermont's SCS program is technical assistance to landowners to plan, design, and construct soil and water conservation measures which protect the soil resource base and water quality. Table 3-1 lists the conservation operations program along with other major water resources programs and their authorities now underway in Vermont. A brief program summary follows. A more comprehensive discussion of federal laws authorizing USDA activities in resource conservation is included in the RCA report, (USDA, 1981).

Table 3-1. Soil Conservation Service Major Water Related Programs in Vermont.

Program Name/No.	Description	Authority
Conservation Operations (CO-01)	. Plan and carry out a national soil and water program through conservation districts.	Soil Conservation and Domestic Allotment Act, PL 74-46, 49 Stat. 163, 16 U.S.C., April 27, 1935.
	. Maintain technical responsibility for design and installation of best management practices to control nonpoint source pollution to improve water quality in designated watersheds - (Rural Clean Water Program).	Agriculture, Rural Development, and Related Agencies Appropriations, FY 1980, 93 Stat. 835, November 9, 1979.

Table 3-1 (Cont'd.)

Program Name/No.	Description	Authority
Watershed (PL-06) Planning	. Plan watershed protection projects which improve water resource management in high priority watersheds.	Watershed Protection and Flood Prevention Act of 1954, PL 83-566, 68 Stat. 666, 16 U.S.C. 1001, August 4, 1954.
Small Watershed Operations (WF-08)	. Design and construct both non-structural and structural measures to implement project plans in priority watersheds.	Same as above: PL 83-566
Basin and Area Planning (RB-09)	. Collect and analyze water, land and related resource data to determine potentials for improving resource protection in coordination with other agencies.	Same as above: PL 83-566

Table 3-1 (Cont'd.)

Program Name/No.	Description	Authority
Resource Conservation and Development (RC&D-11)	. Help local sponsors to plan and implement measures to promote rural development and enhance environmental quality in Vermont's two RC&D areas.	Food and Agriculture Act of 1962, PL 87-703, 76 Stat. 605, 607, 7 U.S.C. 1010, 10113, September 27, 1962.
Resource Inventory and Monitoring (CO-12)	. Complete periodic inventory of land and water resources to identify the quantity and quality of the state's resource base.	Rural Development Act of 197 , PL 92-419, Sect. 302, Title III, (7 U.S.C. 1010a) August 30, 1972. Soil and Water Resources Conservation Act of 1977, PL 95-192, Sect. 2,3, and 5, (16 U.S.C. 2001 et. seq.).
Emergency Watershed Protection	. Provide technical assistance for emergency protection against flooding and for restoration of rural land and conservation systems damaged by natural disaster.	Flood control Act of 1944, PL 78-534, Sect. 216, 58 Stat. 887, 907, 33 U.S.C. 701b-1, December 22, 1944; and Agricultural Credit Act of 1978, PL 95-334, Sect. 403, 92 Stat. 434, 16 U.S.C. 2203, August 4, 1978.

Table 3-1 (Cont'd)

Program Name/No.	Description	Authority
Water Bank Program	. Provide technical assistance for long term agreements with landowners to conserve wetlands and improve wildlife resources.	The Water Bank Act of 1970, PL 91-559, 84 Stat. 1418, 16 U.S.C. 1301 et seq. December 19, 1970; PL 96-182, 93 Stat. 1317, 16 U.S.C. 1302.

Well over 60 percent of the SCS annual budget in Vermont is allocated to support field office efforts to get conservation measures on the land. In general, their water related efforts presently focus on agricultural waste management and cropland erosion control; water conservation and management through measures such as diversions and stripcropping as well as drainage, and irrigation when needed; and water supply for on-farm needs through farm ponds or other watering devices.

Vermont's commitment to erosion control and runoff management has had a dramatic impact on the conservation operations program.

SCS and ASCS (Agricultural Stabilization and Conservation Service) and the Vermont Agency of Environmental Conservation have identified soil erosion and agricultural waste as top priority nonpoint sources of water pollution. Annual funding for animal waste systems in Vermont has tripled since 1978 because of the high priority of the problem, high local interest and need, and increased emphasis by SCS and ASCS. Experience has shown that with current SCS technical staff, some 160 agricultural waste systems can be planned, designed, and constructed each year. Under these conditions, it will be at least 10 years before all remaining waste management needs are met.

Drainage and irrigation are minor components of the overall SCS program. In 1977, excess soil wetness was a problem on 34 percent (206,000 acres) of the state's cropland, (NRI, 1977). SCS estimates that some 200,000 feet of subsurface drainage and 100,000 feet of surface drains will be installed during 1982.

One and one-half percent (109) of the farms in Vermont irrigated their land in 1978, (U.S. Census, 1981). Of the 1,595 acres irrigated, over 80 percent was in harvested cropland. While there is very little Vermont farmland being irrigated today, there was 3 times the land area irrigated in 1978 compared to 1969. Irrigation in Vermont is used for frost protection and as a water supplement during dry years. Almost half of Vermont's irrigation land is in Addison County, followed by farms in Franklin and Windham Counties. The Connecticut River Valley has great potential for expansion of Vermont's production of fruits and vegetables. Irrigation could increase substantially in Windsor, Windham and Orange Counties in the next decade to support this growing, diversified agricultural industry and retain the Valley's prime farmland.

Several Vermont watersheds have been targeted for water quality protection efforts through land treatment and manure management. Design and construction work is now underway in St. Albans Bay Watershed, Lower Otter/Dead Creek, LaPlatte River Watershed, Lake Carmi, and the Lake Parker Watershed. Franklin County farms near St. Albans Bay are getting accelerated treatment under the Rural Clean Water Program. Nutrient and sediment reductions are the major problems to be solved under this program. Similar problems are being solved in the LaPlatte and Lower Otter/Dead Creek, pursuant to PL 83-566, and Lake Parker, and Lake Carmi under the RC&D Program.

Project installation for these watersheds will occur through 1985. Comprehensive, long-term water quality monitoring and evaluation is also being conducted over a 10 year period in the LaPlatte and St. Albans Bay projects. This monitoring will measure the effects of project measures on water quality and it has national significance. The data is expected to be useful for interpreting the benefits of similar land treatment projects in future Vermont watersheds.

Between 1975 and 1980, SCS completed flood prevention projects for the Town of Ludlow in Windsor County and the City of St. Albans in Franklin County. The Jewell Brook Watershed project encompasses 5,875 acres in Windsor County. The project, completed in 1975, includes a multiple purpose impoundment with recreation development, 3 single purpose flood prevention impoundments, and floodwater diversion. The Stevens-Rugg project encompasses 23,552 acres in Franklin County. Phase I of the project includes a flood flow bypass structure and diversion channel, with an associated drop structure and highway crossing in St. Albans City, and was completed in 1979. Additional channel work called for in Phase II of the plan has been deleted with the sponsors concurrence.

Flood prevention and fish and wildlife improvement were the original objectives of the Upper Castleton River project encompassing 20,500 acres in Rutland County. The project was to include a multiple purpose impoundment, dike, water level control structure and 5.8 miles of channel modification. Progress toward implementation has stalemated because of the sponsors inability to acquire control of complex land rights, as well as diminished support from the Vermont Department of Fish and Game. In may 1982 the SCS reviewed the watershed plan and proposed four alternatives for the sponsors' consideration. As of early June 1982 it appears the

sponsors will proceed with implementation of a scaled down version of the original watershed plan. This alternative consists of channel modification along the West Rutland lateral and deletes other features of the original plan.

In addition to the completed and operational watershed projects, Vermont water resources planning and river basin studies continue to accelerate. There are seven watershed projects where sponsors have asked SCS for planning assistance as of March 1982. Each of these projects involve land treatment and manure management for water quality and watershed protection. Plans for the Black River (Orleans County), and the Lemon Fair (Addison County) are scheduled to be developed during 1982.

A cooperative USDA study of agricultural and forest runoff in 19 watersheds will set the stage for a decade of watershed projects to improve water quality in Vermont. With the support from several state agencies, the U.S. Soil Conservation Service, Forest Service and Economic Research Service will soon complete a three year agricultural runoff study. The study will document the types and severity of agricultural pollution and timber harvesting problems found in the Lake Champlain and Lake Memphremagog Watersheds, and in two small inland lakesheds, (Harvey's Lake-Connecticut Basin and Shelburne Pond-Lake Champlain Basin). Land treatment measures, including their costs, environmental, and economic impacts will be evaluated and presented in the study report. The basic information generated through this study will be the foundation for implementing plans through PL 83-566, the Rural Clean Water Program and others. An analysis of timber harvesting access roads in the Browns River Watershed by the Forest Service will serve as a model for the

the proper location of timber harvesting access roads to protect soil and water resources. Assuming each of the Vermont watersheds now in some stage of planning were to have projects authorized for construction, the state's land treatment needs will not be met until well into the 1990's.

SCS has helped nine Vermont rural community governments deal with their flooding problems. Seven Vermont communities have flood insurance studies which SCS prepared at the request of the U.S. Department of Housing and Urban Development. In addition, SCS has completed two flood hazard analyses. SCS is now assisting the Town of Arlington, on the Battenkill River, to prepare a flood plain management report which will map and describe the areas of the town subject to various flood levels. The report will also provide additional information the town may need to improve management of the flood plain. The study is scheduled for completion in 1982. The Vermont Department of Water Resources has asked that SCS continue to be involved in similar flood plain studies, since funding for such studies is no longer available to Vermont communities through the Federal Insurance Administration (FIA).

In recent years, SCS has become involved to a limited degree in shoreline erosion and management problems on Lake Champlain, in an evaluation of potential for aquaculture and in a wetlands protection program. SCS was an active participant in a comprehensive, "Level B", study on Lake Champlain which was coordinated by the New England River Basins Commission and completed in September 1979. Pursuant to Champlain Basin Plan recommendations and in response to requests from Vermont and New York,

SCS has prepared a proposal to study and evaluate shoreline problems along the Lake. The study would identify and formulate alternative treatment plans for critically eroding stretches of lakeshore, with special emphasis on erosion affecting agricultural lands. There is high local and regional interest in addressing present and future shoreline management problems. The proposed study would be coordinated with other USDA agencies, the U.S. Army Corps of Engineers, and interested local groups.

In addition, SCS has prepared a proposal to study three excessively eroding watersheds with agricultural runoff management problems - all situated in the Lake Champlain Basin. The study will commence in FY 83 and will be completed in FY 84.

There is growing interest in aquaculture in Vermont. While not directly a water resources program, commercial fish farming will place demands on the state's ground and surface waters. During 1980, SCS and the University of Vermont conducted a survey to determine the viability of a fish culture program in Vermont.

Physical parameters as well as psychological and sociological attitudes were considered in an effort to identify the most favorable culture methods, areas with the greatest production and marketing potential, and cost effectiveness at different operational levels. The findings and conclusions of these efforts are presented in the publication "Aquaculture A Comprehensive Resource Appraisal for Vermont," October 1980. To

increase the awareness levels of field personnel and the public regarding aquaculture, SCS and the Extension Service developed an informational publication, "Fish Farming in Vermont" and held a two day workshop.

Material developed in 1980 provided the foundation for the 1981 implementation program. SCS personnel plan to advance their biological and engineering capabilities to assist landowners interested in fish culture and develop technical guides and specifications for statewide use. To begin an implementation program, efforts will be concentrated in the Bennington and Otter Creek Natural Resource Conservation Districts in accordance with the findings of the 1980 study. Expected undertakings include development of district sponsored fish stocking programs, intensifying fishpond management plans to readily identify harvestable fish products, and establishment of pilot projects which demonstrate monetary returns. These pilot projects could range from a coordination effort for the utilization of existing ponds of various ownership for commercial production to the development of new facilities. Special emphasis will also be given to energy efficient, small scale production methods that provide supplement income benefits. These efforts will serve to expand the existing aquaculture community in Vermont. Such expansion will help promote future program implementation efforts of a larger scale.

The Water Bank program has been operating since 1972 to protect Vermont's wetland wildlife. In cooperation with ASCS, a total of 132 wetland management plans were developed covering nearly 8,000 acres in Addison and Chittenden Counties.

Vermont will soon have an updated inventory of its soil and water resources. SCS has the responsibility to conduct a continuing appraisal of the quantity and quality of soil, water and related resources for nonfederal lands in the state. Three national resource inventories (or updates) have been conducted since 1958. The current resource inventory is called the National Resources Inventory - 1982. Data is now being collected in Vermont on about three thousand 100 acre sample areas. These sample results will be expanded to provide statewide acreage information. Using infrared photos, SCS personnel are appraising the following major resource conditions:

- Current land cover use and ownership
- Soil resource quality problems
- Land use potential
- Types and use of water bodies
- Extent and condition of flood prone areas
- Location of critically eroding lands

The results of the 1982 inventory will be compared to an updated 1977 inventory to identify important resource trends occuring in Vermont.

Natural flood disasters have threatened lives and property in Vermont over the years. SCS can and has provided technical assistance to install riprap to stabilize streambanks as well as other emergency measures. The emergency watershed protection program provides protection against flooding and for restoration of rural land and conservation systems

damaged by natural disaster. Fortunately for Vermonters, severe natural disasters are rare and emergency watershed protection measures are infrequently necessary. ASCS also administers an emergency conservation program which complements the SCS emergency program.

What's Possible With USDA Help?

Major federal involvement in soil and water conservation measures on private land in this country is less than 50 years old. Since the creation of the U.S. Soil Conservation Service and the organization of state soil conservation districts in the mid 1930's, some 16 pieces of national legislation have been passed to help identify and solve soil and water problems. Table 3-2 relates USDA's soil and water conservation objectives for problem solving to their authorizing legislation. The current programs relevant to Vermont have been previously described; some USDA programs are not applicable to Vermont (e.g., Surface Mining Conservation and Reclamation Act). USDA programs authorities are fully described in the 1980 USDA Appraisal Report, Part II, (USDA, 1981).

Table 3-2. USDA Soil and Water Conservation Programs and their Authorizing Legislation

Authorizing legislation	Flood plains management	Land reclamation	Water supply	Timber productivity	Watershed protection	Wind erosion	Pasture, range productivity	Water quality	Waste management	Irrigation water management	Drainage	Cropland productivity	Habitat development	Outdoor recreation
PL 74-46 Soil Conservation and Domestic Allotment Act----------	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PL 83-566 Watershed Protection and Flood Prevention--------	X		X	X	X	X	X	X	X	X	X	X	X	X
PL 78-534 Flood Control Act of 1940----------	X		X	X	X	X	X	X	X	X	X	X	X	X
PL 81-516 Flood Control Act of 1950----------					X									
PL 87-703 Food and Agriculture Act of 1962----------	X		X	X	X			X	X	X	X	X	X	X
PL 84-1021 Amendment Soil Conservation and Domestic Allotment Act----	X		X	X	X	X	X	X	X	X		X	X	
PL 92-419 Rural Development Act of 1972----------	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PL 95-217 Clean Water Act of 1977----------					X	X		X	X	X				

Table 3-2. USDA Soil and Water Conservation Programs and their Authorizing Legislation

Authorizing legislation	Flood plains management	Land reclamation	Water supply	Timber productivity	Watershed protection	Wind erosion	Pasture, range productivity	Water quality	Waste management	Irrigation water management	Drainage	Cropland productivity	Habitat development	Outdoor recreation
PL 95-87 Surface Mining Conservation and Reclamation Act of 1977----------		X		X	X	X	X	X	X			X	X	X
PL 91-559 Water-Bank Act----------	X		X		X	X		X					X	X
PL 85-58 Third Supplemental Appropriations Act of 1957--------	X	X	X		X	X	X	X	X	X	X	X	X	
PL 79-733 Agricultural Marketing Act of 1946--------	X	X	X		X	X	X	X	X	X	X	X		X
PL 95-313 Cooperative Forestry Assistance Act of 1978----------	X	X	X	X	X			X	X			-	X	X
PL 70-466 McSweeny-McNary Act, 1928---	X	X	X	X	X	X	X	X	X				X	X
24 Stat. 440 Hatch Act, 1887----		X	X	X	X	X	X	X	X	X	X	X		X
PL 63-95 Smith-Lever Act, 1914----	X	X	X		X	X	X	X	X	X	X	X		

Source: USDA, 1980 Appraisal Part II, 1981.

The national directions and focus of SCS are based on an understanding of local resource problems. Conservation districts, farm organizations, resource groups, SCS personnel, and others have made suggestions which has led to the development of a set of twelve national goals for the Service. (See Table 3-3).

The national goals for a strong resource program match pretty well with Vermont's needs. The national agenda directs that high priority be given to the following topics:

- erosion reduction
- flood prevention
- water supply and management
- water quality and management
- agricultural land retention

SCS is targeting funding for these activities throughout the country. In Vermont, erosion control and animal waste disposal are now the targeted activities. Accelerated funding will be required during the next decade for several of Vermont's problems to assure that they are effectively controlled in a reasonable time frame. Table 3-4 summarizes the type of SCS assistance available under current programs to help address Vermont problems.

Table 3-3

Soil Conservation Agenda

Goals of the Soil Conservation Service, U.S. Department of Agriculture

1. Give high priority to erosion reduction; flood prevention; water management, water quality and agricultural land retention, especially where opportunities to sustain and improve the productive capacity of the resource are greatest.

2. Complete the Appraisal and Program reports called for in the Soil and Water Resources Conservation Act of 1977 and transmit, with statement of Presidential policy, to Congress.

3. Develop consensus among the Administration, Congress, the soil conservation community, farm organizations, and others on steps needed in both public programs and private actions to conserve and use properly the Nation's soil and water resources.

4. Achieve more effective participation by conservation districts, state soil conservation agencies, and other units of local and state government in planning and carrying out an effective nationwide soil and water conservation program.

5. Expand use of innovative, cost-effective, and energy-efficient technology in addressing priority conservation needs.

6. Reduce overhead, increase the proportion of the work force providing direct service in the field, and improve the efficiency of program operations.

Table 3-3 (Cont'd)

7. Develop and apply information and actively support research and studies on the relationships between erosion and productivity, tolerable soil loss limits, the validity of erosion equations, and land treatment effects on water quality.

8. Improve resource inventory, appraisal, and assessment procedures, including development and maintenance of integrated data bases.

9. Remove or streamline burdensome and cumbersome policies, requirements, and rules and regulations.

10. Utilize modern information technology in the management of Soil Conservation Service activities.

11. Strengthen and fully utilize program analysis and evaluation capabilities throughout the Soil Conservation Service.

12. Serve as the Nation's advocate for wise use of America's soil and water resources, and achieve recognition of the U.S. Department of Agriculture as the Nation's principal natural resources agency concerned with the protection and development of the major portion of America's land, water, and related resources.

Table 3-4 SCS Programs and Vermont Water Problems

Major SCS program \ Vermont water problem	Surface water pollution/lake eutrophication	Ground water pollution	Flooding	Stream flow allo-cation	Acid precip-itation	Wet-lands	Water supply	Shore-land mgmt.	Urban storm water	Stream-bank mgmt.	Water oriented outdoor recreation	Drainage
Conservation Operations	3	3	3	1,2,3*		3	3	3	3	3	3	3
Watershed Planning	1,2	1,2	1,2	1,2*		1,2	1,2	1,2	1,2	1,2	1,2	1,2
Small Watershed Operations	3,4	3,4	3,4	3*			3,4	3	3	3,4	3,4	3,4
River Basins Surveys	1,2	1,2	1,2			1,2	1,2	1,2	1,2	1,2	1,2	1,2
Resource Cons. & Develop. (RC&D Counties only)	1,2,3,4	1,2,3,4	1,2,3,4				1,2,3,4	1,2,3,4		1,2,3,4	1,2,3,4	1,2,3,4
Resource Invent. & Monit. (State-wide only)	1	1	1			1	1		1	1	-	1
Emergency Water-shed Protection			3,4						3,4	3,4		3,4
Water Bank Program						3,4						

Legend: Types of USDA-SCS Assistance
1- Resource Inventory, Analysis, Monitoring
2- Resource Planning, Studies
3- Technical Assistance (including conservation planning and application)
4- Financial Assistance

*Hydropower storage may be included in multiple purpose flood prevention projects, but as a non cost-shared project element.

CHAPTER 4

ASSISTING VERMONT'S WATER RESOURCES PROGRAM FOR THE 80's AND BEYOND

Priority Problems

The Soil Conservation Service can help solve several of Vermont's important water resource problems. Some problems are well-defined and the role of SCS is clear. However, solutions to some water problems will take a more precise definition of the role of SCS. Table 4-1 presents six generalized criteria for establishing SCS program priorities. For each major resource problem for which SCS can provide substantial assistance, numerical scores from 1 to 3 are assigned for each criteria category. The factors important to resolving the problems and defining the programs include: geographic scope of the problem; state importance; national importance; availability of SCS resources; potential for project implementation; and anticipated effects on natural resources and social (human) environment. Table 4-2 presents the results of this program assessment. Arbitrary grouping of the problems results in the following program priorities for problem solving:

High Priority	-	Erosion control and livestock waste management
		Flood control
Medium Priority	-	Shoreland management
		Urban/stormwater management
		Streambank management

Low Priority	-	Drainage Streamflow allocation Wetlands management Groundwater pollution prevention Water supply

Table 4-1 Procedure for Priority Setting of Vermont Water Problems

Category	Priority Score
1. Geographical Scope	
. Statewide-found in all major drainage basins	1
. Regional-dominates in several major subbasins, counties or in less than two major basins	2
. Local-isolated problem areas in a few scattered locations	3
2. State Importance	
. Integral part of approved statewide strategy for problem resolution	1
. Considered high priority by State departments, districts, and others but more information needed for action	2
. May be of substantial benefit for future program action if funds could be made available.	3
3. National Importance	
. A problem targeted nationally for accelerated funding	1
. Problem identified by RCA Vermont respondents (greater than 90% agree or strongly agree)	2
. Problem identified in National Water Assessment and/or National Resources Inventory	3

Table 4-1 (Cont'd.)

Category	Priority Score
4. SCS Resource Availability	
. Current resources adequate and available	1
. Current resources adequate but not available due to competing resource demands	2
. Critical resources not adequate but could likely be made available within two years	3
5. Potential for Resource Project Implementation	
. Projected net benefit and local sponsorship assured	1
. Projected marginal net benefits and good local interest in project	2
. No net benefits and good local interest	3
6. Effects on Natural and Social (human) Environment	
. Substantial improvement in quantity/quality of water resources and protection of life, health, safety of people/property	1
. Moderate, but measureable improvement in natural resource quantity/quality and moderate levels of protection of life, health, safety of people/property	2
. Prevent further deterioration of natural resource quantity/quality and protection of life, health, safety of people/property	3

Key Program Elements

Vermont SCS's long-range water resources program through the 1980's will be comprised of four principal elements:

1. Watershed protection projects in priority watersheds, tributary to Lake Champlain, and Lake Memphremagog, and lakesheds throughout the state;

2. Flood plain management assistance in priority towns requesting help in the Champlain and Connecticut drainage basins. A coordinated effort with New Hampshire towns bordering the Connecticut River is recommended;

3. Special projects addressing critical resource problems might include:

   - Lake Champlain shoreline erosion and management
   - Hydrologic effects of development in selected Vermont watersheds
   - Water conservation in Vermont agriculture
   - Pesticide management and water quality in Vermont

   The direction and focus of special projects will be jointly determined each year by USDA, affected State of Vermont agencies, and appropriate local sponsors; and

4. Interagency coordination including close working relationships between the State Conservationist, the Governor and/or the Vermont Commissioner of Agriculture and Secretary of Environmental Conservation, and their respective water resource program managers.

1. Watershed Protection Program

The quality of Vermont's lakes and streams can be protected and enhanced by a strong program of non-point source pollution control which is carefully designed to complement an aggressive point source control effort. Voluntary action by landowners and technical and financial resources from several USDA agencies will be needed over the next decade. As mentioned in Chapter 3, the Soil Conservation Service can use several of its programs to assist in the reduction of non-point source pollution through erosion control and livestock waste management. The term "Watershed Protection Program" is applied when the small watershed operation program is used to accelerate technical and financial assistance for non-point source pollution control on specified watersheds. A program sketch is detailed below.

. Program Objectives

Vermont's watershed protection program is intended to reverse the decline in aesthetic, ecological and recreational value of selected surface waters in the state. Further, the program will strive to improve on-farm resource management without reducing farm income and productivity. In the short-range the program will contribute towards controlling excess loss of nutrients, sediment, pesticides/herbicides, bacteria and organic wastes from the land. Groundwater protection from infiltration of nitrates, pesticides/herbicides, and other substances are also long-range program objectives.

. Major Program Tasks

More than any other foreseeable program involving the Vermont SCS, watershed protection will require substantial staff and financial resources to meet known needs in the next decade. Upon the completion of the Vermont Agricultural Runoff Study in Selected Vermont Watersheds, there will be an improved basis for setting priorities for initiating detailed watershed or lakeshed plans. Watershed protection projects will require a minimum of 18 months from the time of planning authorization, for data collection, analysis, plan preparation and review. After the plan is approved and authorized for construction, field office assistance for design and construction of approved farm plan elements will accelerate and extend up to five years for most watersheds and two years for most lakesheds. Water quality monitoring over the life of the project will occur in each approved problem area.

. Implementation Activities

The principal USDA agencies involved in the program are the SCS and ASCS. The Forest Service will play a minor role in future projects, except where commercial timber harvesting is projected to sharply accelerate during the project life. If the City of Burlington constructs its planned 50 megawatt wood-fired power plant, the demand for wood in the surrounding counties will increase, along with the potential for water pollution from timber harvesting. The Extension Service will need to accelerate their educational programs in the project areas.

Natural Resources Conservation Districts potentially involved with future watershed protection projects (beyond ongoing programs) include the following:

- Franklin NRCD - 4 watersheds
  2 lakesheds
- Winooski NRCD - 4 watersheds
  1 lakeshed
- Lamoille NRCD - 1 lakeshed
- Otter Creek NRCD - 7 watersheds
- Poultney-Mettawee NRCD - 1 watershed
  2 lakesheds
- Orleans NRCD - 3 watersheds
- Caledonia NRCD - 1 lakeshed
- White River NRCD - 1 watershed

. Schedule and Costs

The following schedule for the watershed protection program is based on these assumptions;

1. No more than two such projects can be started in any future fiscal year.

2. The maximum number of project areas based on current data would cover 20 watersheds and 7 lakesheds.

3. Wherever there is a project need, local sponsors will support it.

4. National funds will continue to be available at least at the current level.

Planning for watershed protection in all 27 watersheds now being evaluated would extend to FY 1995. Project measure application in all 27 watersheds would be complete by FY 1998 with water quality monitoring occurring in a maximum of 8 watersheds between FY 1982 and 1991, and up to 6 watersheds monitored from FY 1992 to FY 1998. The total estimated USDA cost of these projects is $23 million with an average of about $1.5 million per year. The Soil Conservation Service's total cost for technical assistance and project administration is approximately $6 million. In the next two years (FY 1982 to FY 1984) these projects will be further evaluated

by SCS and the state and local sponsors for their relative importance to water quality protection in Vermont. Only the highest priority watersheds will proceed to completion. This preliminary project schedule should be revised to reflect this reevaluation. In addition, careful evaluation of a long-term water quality monitoring strategy will be necessary to maximize the use of individual project funds and also get the most appropriate water quality information to assess project effectiveness.

2. Flood Plain Management Program

The public health and safety of Vermont residents and property can be protected through the cooperative efforts of local, state, and federal governments. There is a clear role for the technical assistance SCS can provide to priority communities to help reduce existing or potential flood problems. Financial assistance for structural and/or nonstructural solutions can also be made available in localized problem areas. A sketch of the SCS flood plain management program follows.

. Program Objectives

Vermont's flood plain management program is designed to help promote wise use of flood plains and reduce the flood damage susceptibility of existing development and uses in flood plains. The program can contribute to the sound management of Vermont's prime farmland soils which are characteristically located in river valleys. Water quality recreational use and aesthetic values can be substantially enhanced through flood plain management.

Major Program Tasks

The flood plain program consists of two principal components: flood plain management studies for priority Vermont towns; and flood plain management assistance in response to local interest. The Soil Conservation Service plans to conduct no more than one flood plain management study per year. The selection of individual study areas will depend a great deal on the degree of interest and financial commitment of local government agencies.

The U.S. Army Corps of Engineers is also actively conducting flood studies in Vermont towns. Selection of the Vermont towns needing studies will be annually determined by the state, the towns and SCS as a product of the annual agencies coordination meeting. Upon the completion of such studies, a determination can be made of sponsor interest and project potential for implementation of a PL 83-566 project for flood damage prevention. Presently, only the Black River (Ludlow) area is being assessed for project potential by the SCS New England regional planning staff. Future projects in Vermont involving reservoir construction and/or other major structural components will receive intensive scrutiny by state agencies and other groups for their project impacts on future flood damages and the environment. The State of Vermont has determined there are 20 towns in need of flood plain studies that SCS should consider, (Table 2-6). Two are located in the Champlain Basin and the rest are in the Connecticut River Basin.

Each study will require a maximum of 18 months to complete. Wherever adjoining towns in the same hydrologic system need studies completed, consideration should be given to staging the studies from the headwater town to minimize the hydrologic data collection and analysis effort that would be needed for these adjoining towns.

. Implementation Activities

Upon receipt of a request for SCS assistance, the Service will act as the principal responsible agency in cooperation with the sponsoring community/towns. The Soil Conservation Service field office staff will be called on by state and regional office staff to collect basic flood plain data, and participate with local community coordination as appropriate. The district and field offices potentially affected by the studies program include the following.

NRCD	SCS Field Offices
Winooski	Essex Junction, Montpelier
White River	Randolph
Otter Creek	Middlebury
Ottauquechee	Woodstock
Caledonia	St. Johnsbury
Windham	Brattleboro

. Schedules and Costs

The following schedule for the flood plain management program is based on these assumptions.

1. No more than one flood plain management study would be in process in any future fiscal year. The Soil Conservation Service state staff would assume the responsibility for doing the studies.

2. The U.S. Army Corps of Engineers will continue to conduct at least two comparable studies per fiscal year until all needs are met.

3. Wherever there is a need, local towns are willing to support the study.

4. National decisionmakers will continue to consider flood damage prevention as a high priority problem and fund the studies needed.

5. If a major flood plain management project were to be developed from these or previous studies, the SCS state office staff would defer new studies until the project was completed.

Flood plain studies in 15 towns would extend to FY 1998 unless a major program push accelerates the Vermont effort or the report's technical detail is decreased to shorten the study process. Each study is estimated to cost $50,000, giving a total USDA cost of $750,000 through FY 1998. The study needs and costs will be reevaluated annually.

3. Special Projects Program

The purpose of the special projects program is to bring SCS resources to bear on emergency and/or short-term water resource problems in Vermont. No project in the program will extend longer than two years. The program will be responsive to needs documented by field personnel, USDA agencies, state agencies and others. Close cooperation between agencies will be essential to make the best of limited funds and the most of agency personnel. Specific projects included in the program will be reviewed during the annual budget preparation process.

. Program Objectives

The special projects program is intended to preserve, protect, and enhance the state's water and related land resources. Further, the program provides the framework for analyzing the present and future forces which may cause or intensify water resource problems. Through improved analysis of selected problems and solutions, technical assistance to Vermont landowners and communities will stay in tune with resource management practices that work, are affordable, and are acceptable to Vermonters.

. Major Program Tasks

The two principal program elements include:

1 - Emergency Watershed Protection; and

2 - Special Studies

In the event of natural disasters, SCS will respond to requests for technical assistance for emergency protection against flood and erosion damages. This assistance is available to all areas of the state and is used to complement other state and federal actions during and after natural disasters.

This program provides a valuable stand-by service to the people of Vermont. The technical design and construction service is direct and immediate when conditions for emergency flood prevention assistance are met.

SCS can also work with local sponsors to conduct special studies to analyze resource problems and recommend specific project actions. Whenever appropriate the U.S. Forest Service, Economic Research Service or other federal agencies may participate with the Service in cooperative studies when study needs are defined. Study proposals and requests for federal funds are prepared and submitted to the National Headquarters of SCS for authorization to proceed. Special studies are conducted by the SCS state office staff with assistance from field office personnel. Assuming no major change in state personnel, these studies can generally be expected to be completed within two years after authorization to conduct the study. Furthermore, no more than two special studies will be conducted in any future fiscal year.

In addition to short-term studies, selected resource problems may be able to be addressed through special field evaluation surveys. Field surveys are designed to provide technical expertise and advice on site specific resource problems such as a review of the problem of removal and/or replacement of streambank vegetation along the Mettawee River. Field surveys use existing federal personnel, require close coordination with local concerned agencies or groups and would result in a brief technical report on findings and recommended next steps to solve the problem as appropriate. Field evaluations could be of substantial value in solving site-specific problems in Vermont without having to wait for special funds.

- Future Project Proposals

  The shoreline of Lake Champlain currently faces severe shoreline erosion on stretches of rural and developed land. The States of Vermont and New York have requested USDA agencies to help define appropriate solutions to shoreline erosion and management problems, especially on selected critical areas. SCS submitted a proposal for a two year study of Lake Champlain Shoreline Erosion and Management. If approved, this study will result in a shoreline erosion control plan for critical erosion problems on the shoreline and related areas along Lake Champlain in Vermont and New York. The proposal request has lower priority than some of the above projects; therefore, no study date has been set.

The States of Connecticut, Massachusetts, New Hampshire and Vermont are coordinating their activities in the Connecticut Valley to: 1) control erosion on cropland, 2) minimize the loss of agricultural land, 3) prevent the further decline of the region's agricultural activity, 4) minimize damage from flooding, 5) help protect and manage the quality of the water resources, and 6) support state and local actions to accomplish these objectives. The project will be a five year effort involving data gathering, evaluations, direct technical assistance and financial assistance as appropriate.

The current USDA Agricultural Runoff Study has ranked 19 watersheds in terms of severity of agricultural runoff including excessive cropland erosion and improper manure management. USDA (ERS, FS and SCS) submitted a Proposal to Study in March 1982 to prepare watershed reports on three of the most problem watersheds identified in this study. The watershed reports could be readily modified as watershed plans for PL-566 implementation. If authorized this study will begin in early fiscal year 1983.

The nature and scope of additional studies which SCS might assist local sponsors prepare should be assessed annually. During the course of this assessment some problems and ideas for possible future study topics emerged. One is included here only to illustrate a type of resource problem that SCS might help to solve in Vermont.

. Hydrologic Effects of Development in Vermont Watersheds

Suburban development near Vermont's major urban areas is increasing and may change runoff volume and peak runoff rates in receiving streams. For selected urbanizing watersheds, SCS has the capability to apply analytical procedures to estimate the magnitude and frequency of future flood events under current and changed land use conditions. Discussion with state and regional agencies will be needed to clarify specific needs.

4. Interagency Coordination Programs

. Program Objectives

The purpose of interagency coordination is to foster open and direct communication between the Soil Conservation Service in Vermont, the Governor of Vermont, and/or senior level state agency officials. Through this informally structured program, new state and federal water resource policies and program directions can be jointly understood and implemented in Vermont. The program promotes close, periodic contact between program managers, legislative liaisons, and agency leaders in a friendly, informational setting.

. Major Program Tasks

The two principal program elements include:

1. Annual meeting between the State Conservationist, the Governor and/or the State Commissioner of Agriculture and the Secretary of Environmental Conservation.

2. Annual interagency meeting, following the Governor's meeting, with principal program managers, especially SCS and the Departments of Water Resources and Fish and Game.

The coordination programs would involve the scheduling of two meetings per year. The Governor's meeting would be largely informal and informational. The State Conservationist would discuss the current program accomplishments for several selected problems in Vermont. In addition, he may forecast the impact of new policies, budgets, etc. on helping to meet state needs. A briefing book on SCS program accomplishments in Vermont would be prepared for the Governor and the agency heads.

Subsequent to the Governor's meeting, SCS water program managers would meet with counterpart state agency staffs.

Detailed reports would be prepared by program managers on current water problems, policies, studies, etc. Issues needing resolution would be identified and personnel assigned to make recommendations within a reasonable time period. Minutes of the meeting would document the principal conclusions and unresolved issues to be addressed during the year.

A related activity for which the State Conservationist in Vermont has assigned leadership is the coordination of USDA in New England and the New England/New York Water Resources Council within the New England Governors' Conference. The Water Resources Council provides the regional forum for the coordination of water resource planning and management between the states, the Federal agencies with related authorities and responsibilities, and the citizens of New England.

It is not clear at this time what the specific functions of the Water Resources Council will be and what involvement USDA will have. The Council was established by the Governors of the region after termination of the New England River Basins Commission so that the necessary coordination of water related issues can continue.

Water Resources Program Monitoring and Evaluation

A systematic procedure will be established for monitoring and evaluating accomplishments in each of the four major water programs. An SCS program manager will be designated by the State Conservationist to develop and carry out the procedure. The concept, in general, is to establish a tracking system which quantitatively (and qualitatively) measures annual progress in each program area. Each year, a program accomplishment report will be prepared by the assigned managers. The report results will include project accomplishments, new project proposals, suggest revisions in problem priorities, etc., and will be used to keep this assessment current. The format for such reports may closely follow Vermont's Annual Plan of Operations (APO).

Table 4-2
Water and Land-Related Resource Programs Ranking

Category \ Program Action	Watershed** protection	Ground water pollution	Flood control	Stream flow allo-cation	Wet-lands mgmt.	Water supply	Shore-land mgmt.	Urban runoff/ storm-water mgmt.	Stream-bank mgmt.	Water oriented outdoor recreation	Drainage
1. Geographical Scope of Problem	2	3	2	3	2	3	2	3	3	1	2
2. State Importance	1	2	1	2	3	3	1	2	2	1	3
3. National Importance	1	3	1	3	3	3	3	3	3	3	3
4. SCS Resources Available	1	2	3	1	1	3	2	2	1	2	1
5. Potential for Project Implement-ation	1	3	2	3	3	3	2	2	3	2	2
6. Environmental and Social Impacts	2	3	2	3	3	2	2	1	2	2	2
Total Score	8	16	11	15	15	17	13	13	14	11	13
Program Rank	1	10	2	8	9	11	4	5	7	3	6

** Erosion and livestock waste management.

Table 4-3
Estimated SCS Staff Years 1/ to
Implement Water Resources Programs

Water Resources Program 4/ Element / SCS Technical Assistance	Watershed Protection			Flood Plain Management			Special Projects			Interagency Coordination		
	Current plan 1983	5 Year plan 2/ (1983-1987)	Long range plan 2/ (1989 and beyond)	Current plan 1983	5 Year plan 2/ (1983-1987)	Long range plan 2/ 1988	Current plan 1983	5 Year plan 2/	Long range plan 1988	Current plan 1983	5 Year plan 2/	Long range plan 2/
1. Resource Inventory and Analysis	2.0	1.5	0.5	0.6	0.6	0.4	0.1	0.2	0.2	0	0	0
2. Resource Plan Development	3.8	4.2	2.8	0.1	0.1	0.1	0.1	0.3	0.3	0	0	0
3. Technical Planning and Application	5.8	7.4	6.8	.5	0.5	0.3	0.3	0.4	0.3	0	0	0
4. Monitoring, Evaluation, 3/ and Coordination	1.0	1.2	0.3	0.4	0.4	0.4	0.1	0.1	0.1	0.2	0.4	0.4
TOTAL	12.6	14.3	10.4	1.6	1.6	1.2	0.6	1.0	0.9	0.2	0.4	0.4

Notes 1/ Does not include assistance from New England Planning Staff.
2/ Average staff years per year for the period.
3/ Does not include cooperative agreements for water quality M&E.
4/ Does not include inputs from conservation operations program.

TABLE 4-4

Watershed Protection Projects
Anticipated Schedule and
USDA Costs 1/ for FY 1983

Project	Preauthorization Planning 6/	Financial Assistance	Project Administration	Planning	Application	Monitoring	Total
LaPlatte 2/	-	138	22	27	15	125	327
St. Albans Bay 3/	-	-	-	15	15	10	40
Lower Otter/Dead Creek	-	260	29	29	25	1	344
Lake Carmi 4/	-	110	10	7	9	0	136
Black River	-	80	14	10	8	2	114
Lower Winooski	30	60	7	5	5	0	107
Lemon Fair	20	-	-	-	-	-	20
Champlain Local (SO)	30 5/	-	-		-	-	30
Pike River/Rock Cr.	30 5/	-	-	-	-	-	30
Champlain Local (NO)	30 5/	-	-	-	-	-	20
Clyde River	20	-	-	-	-	-	20
Total PL-566 Cost	70	538	72	71	53	128	932
Total Cost	160	648	82	93	77	138	1198

1982 Prices:
1/ In thousands of dollars; does not include Forest Service
2/ All projects PL-566 unless otherwise stated.
3/ RCWP cost
4/ RC&D
5/ River Basin Funds
6/ Does not include funds for New England Water Resource Planning Staff

TABLE 4-5

Watershed Protection Projects

Anticipated Schedule and
USDA Costs 1/ for FY 1984

Project	Preauthorization Planning 6/	Financial Assistance	Project Administration	Planning	Application	Monitoring	Total
LaPlatte 2/	-	-	18	6	18	125	167
St. Albans Bay 3/	-	-	-	15	20	10	45
Lower Otter/Dead Creek	-	261	28	28	26	5	348
Black River	-	200	20	20	18	2	260
Lower Winooski	-	100	10	10	8	0	128
Lemon Fair	20	-	-	-	-	-	20
Harvey Lake 4/	30	-	-	-	-	-	30
Champlain Local (SO)	30 5/	-	-	-	-	-	30
Pike River/Rock Cr.	30 5/	-	-	-	-	-	30
Champlain Local (NO)	30 5/	-	-	-	-	-	30
Clyde River	50	-	-	-	-	-	50
Total PL-566 Cost	**100**	**561**	**76**	64	70	132	1003
Total Cost	190	561	76	79	90	142	1138

1982 Prices:
1/ In thousands of dollars; does not include Forest Service
2/ All projects PL-566 unless otherwise stated
3/ RCWP Cost
4/ RC&D
5/ River Basin Funds
6/ Does not include funds for New England Water Resource Planning staff

TABLE 4-6

Watershed Protection Projects
Anticipated Schedule and
USDA Costs 1/ for FY 1985

Project	Preauthorization Planning 6/	Financial Assistance	Project Administration	Planning	Application	Monitoring	Total
Laplatte 2/	-	-	10	5	17	120	152
St. Albans Bay 3/	-	-	-	3	20	10	33
Lower Otter/Dead Creek	-	174	21	11	25	5	236
Black River	-	200	25	20	25	2	272
Lower Winooski	-	200	20	20	20	0	260
Lemon Fair	-	80	10	10	8	0	108
Harvey's Lake 4/	10	-	-	-	-	-	10
Champlain Local (SO)	10	-	-	-	-	-	10
Pike River/Rock Cr.	10	-	-	-	-	-	10
Champlain Local (NO)	10	-	-	-	-	-	10
Clyde River	-	100	12	10	10	0	132
Candidate #1	50	-	-	-	-	-	50
Total PL-566 Cost	50	754	88	76	105	127	1200
Total Cost	90	754	88	79	125	137	1273

1982 Prices: 1/ In thousands of dollars; does not include Forest Service
2/ All projects PL-566 unless otherwise stated
3/ RCWP Cost
4/ RC&D
5/ River Basin Funds
6/ Does not include funds for New England Water Resource Planning Staff

TABLE 4-7

Watershed Protection Projects
Anticipated Schedule and
USDA Costs 1/ for FY 1986

Project	Preauthorization Planning 6/	Financial Assistance	Project Administration	Planning	Application	Monitoring	Total
LaPlatte 2/	-	-	14	5	16	120	155
St. Albans Bay 3/	-	-	-	3	20	10	33
Lower Otter/Dead Creek	-	20	8	3	15	6	52
Black River	-	200	25	20	25	2	272
Lower Winooski	-	200	20	20	20	0	260
Lemon Fair	-	150	15	15	15	0	195
Harvey's Lake 4/	-	100	10	7	9	0	126
Champlain Local (SO)	-	-	-	-	-	-	-
Pike River/Rock Cr.	-	100	15	10	5	0	130
Champlain Local (NO)	-	-	-	-	-	-	
Clyde River	-	150	15	15	15	0	195
Candidate #1	30	-	-	-	-	-	30
Candidate #2	30	-	-	-	-	-	30
Total PL-566 Cost	60	820	112	88	111	128	1319
Total Cost	60	920	122	98	140	138	1478

1982 Prices: 1/ In thousands of dollars; does not include Forest Service
2/ All projects PL-566 unless otherwise stated
3/ RCWP Cost
4/ RC&D
5/ River Basin Funds
6/ Does not include funds for New England Water Resource Planning Staff

TABLE 4-8

Watershed Protection Projects
Anticipated Schedule and
USDA Costs 1/ for FY 1987

Project	Preauthorization Planning 6/	Financial Assistance	Project Administration	Planning	Application	Monitoring	Local
LaPlatte 2/	-	-	12	5	15	118	150
St. Albans Bay 3/	-	-	-	5	15	10	30
Lower Otter/Dead Creek	-	-	5	1	10	6	22
Black River	-	100	10	10	10	2	132
Lower Winooski	-	200	20	20	25	0	265
Lemon Fair	-	200	20	20	25	0	265
Harvey's Lake 4/	-	150	12	9	11	0	182
Champlain Local (SO)	-	-	-	-	-	-	-
Pike River/Rock Cr.	-	200	25	25	25	0	275
Champlain Local (NO)	-	100	15	10	10	0	135
Clyde River	-	200	25	20	25	0	270
Candidate #1	-	-	-	-	-	-	-
Candidate #2	40	-	-	-	-	-	40
Candidate #3	20	-	-	-	-	-	20
Total PL-566 Cost	60	1000	132	111	145	126	1574
Total Cost	60	1150	144	125	171	136	1786

1982 Prices: 1/ In thousands of dollars; does not include Forest Service
2/ All projects PL-566 unless otherwise stated
3/ RCWP Cost
4/ RC&D
5/ River Basin Funds
6/ Does not include funds for New England Water Resource Planning Staff

TABLE V-9

Watershed Protection Projects
Anticipated Schedule and
USDA Costs 1/ for FY 1988

Project	Preauthorization Planning 6/	Financial Assistance	Project Administration	Planning	Application	Monitoring	Local
LaPlatte 2/	-	-	6	1	2	118	127
St. Albans Bay 3/	-	-	-	5	15	10	30
Lower Otter/Dead Creek	-	-	4	1	10	6	21
Black River	-	-	-	-	5	0	5
Lower Winooski	-	-					
Lemon Fair	-	200	18	20	25	0	263
Champlain Local (SO)	-	100	10	10	10	0	130
Pike River/Rock Cr.	-	200	25	20	20	0	265
Champlain Local (NO)	-	200	20	20	15	0	255
Clyde River	-	200	15	20	20	0	255
Candidate #1	-	-	-	-	-	-	-
Candidate #2	-	-	-	-	-	-	-
Candidate #3	40	-	-	-	-	-	40
Total PL-566 Cost	40	900	98	92	107	124	1361
Total Cost	40	900	98	97	122	134	1391

1982 Prices: 1/ In thousands of dollars; does not include Forest Service
2/ All projects PL-566 unless otherwise stated
3/ RCWP Cost
4/ RC&D
5/ River Basin Funds
6/ Does not include funds for New England Water Resource Planning Staff

TABLE 4-10

Floodplain Management Projects
Anticipated Schedule and Costs
FY 1983-1988

Project Town	1/ Cost (Thousands)					
	FY-1983	FY-1984	FY-1985	FY-1986	FY-1987	FY-1988
Norwich	30	-	-	-	-	-
Underhill Update	5	-	-	-	-	-
Vergennes	-	25	10			
Ferrisburg		10	25	-	-	-
Pittsfield	-			25	15 1	-
Stockbridge	-	-	-	15	30	-
Sharon	-	-	-	-	-	30
Total	35	35	35	40	45	30

1/ Cost in 1982 dollars

TABLE 4-11

Cooperative River Basin Studies
Anticipated Schedule and Costs
FY 1983-1987

Study		Cost (Thousands) FY-1983	FY-1984	FY-1985	FY-1986	FY-1987
Erosion Control and Runoff Management In High Priority Vermont Watersheds	SCS	119	124			
	ERS	40	40	-	-	-
	FS	5	6			
Total		159	170			
Vermont Pgr'l. Land Study in Conn. Basin	SCS			80	40	
	ERS			60	30	
	FS	-	-	10	10	
Total				150	80	-
Lake Champlain Shoreline Erosion and Management Study	SCS				40	40
	ERS				30	30
	FS	-	-	-	10	10
Total					80	80
Total SCS		119	124	80	80	40

1/ 1983 dollars

A summary of anticipated technical assistance costs of SCS in Vermont for River Basin Activities for the next five years is as follows:

TABLE 4-12 (Thousands)

	1983	1984	1985	1986	1987
Floodplain Management	35	35	35	40	46
Cooperative Studies	119	124	80	80	40
Coord. with N.E. Gov. Conf.	10	12	15	15	15
Total	164	171	127	135	110

PL-566 Watershed Project Costs for the same time period are:

TABLE 3-13 (Thousands)

		1983	1984	1985	1986	1987
Preauthorization Planning	(06)	70	100	50	60	60
Application Technical Assistance	(08)	196	210	269	311	388
Application Financial Assistance	(08)	128	132	127	128	126
Total		932	1003	1200	1319	1574

There are also water resources costs related to other program areas. No attempt is made here to identify specifically either the costs or the activities. Such program areas include:

Conservation Operations Technical Assistance

Inventory and Monitoring

Resource Appraisal and Program Development Technical Assistance

Watershed Planning for other than Watershed Protection

Watershed Application, Technical and Financial Assistance for other than Watershed Protection

RC&D Technical Assistance for Water Resources Plans

RC&D Financial Assistance for Water Resources Plans

The estimate of SCS staff years to implement Water Resources programs, Table 4-3, does include all program areas that involve Water Resources. The average for the five-year estimate is 17.3 staff years per year. Using $29,500 cost per staff year results in an average cost of $511,000 per year. The technical assistance costs for River Basins and PL-566 planning and implementation, excluding cooperative agreements for monitoring and evaluation, average $484,000 for the same five-year period. The difference between the two amounts for the period, $27,000 per year, is the cost of other programs, exclusive of CO-01, that relate to Water Resource management directly. No attempt is made to quantify that portion of CO-01 that directly benefits Water Resource objectives.

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